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CHARLES ATWOOD KOFOID
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WITH 10 PLATES

(Contributions from the Museum of Vertebrate Zoology of the University of California)

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REPORT ON A COLLECTION OF BIRDS AND MAMMALS FROM VANCOUVER ISLAND

BY
HARRY S. SWARTH

Smithsonian Institution
FEB 23 1912
National Museum

UNIVERSITY OF CALIFORNIA PRESS
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INTRODUCTION

In 1910 Miss Annie M. Alexander organized and financed an expedition for the purpose of collecting the higher vertebrates on Vancouver Island. This she led in person during a large part of the summer. Miss Alexander, accompanied by Miss Louise Kellogg, left Berkeley on April 18, beginning the work of collecting at Parksville, April 24. Here they secured the services of Mr. E. Despard, an expert hunter and trapper, who remained with the party throughout the summer and who secured nearly all of the larger mammals taken. The writer left Berkeley on June 4, arriving at the expedition's camp at Beaver Creek on June 9. On July 1 Miss Alexander and Miss Kellogg returned

home, while the writer, together with Despard, continued the work at various points until September 28. The accompanying map (pl. 1) shows the country traversed and the various collecting stations.

The material collected consists of 554 mammal skins with skulls, 1142 birds, three sets of birds' eggs and four nests, twenty-three reptiles and two batrachians. In addition to these, two marten skins with skulls were purchased from Despard, and a wolf and a wolverine skin from the storekeeper at Nootka Sound, after the termination of the trip. Owing to the small number of reptiles and batrachians collected, and to the total lack of comparable material from the neighboring mainland, it was not thought advisable to include them in this report, which consequently deals solely with the birds and mammals. The collections of the expedition were all donated by Miss Alexander to the University of California Museum of Vertebrate Zoology, and together with the field notebooks of the various members of the party, form the basis of the present report.

One hundred and eleven species of birds are listed, eighty-nine of which were collected. This is in no sense to be taken as a complete catalogue of the birds of Vancouver Island. Many other species are known to occur, but only those actually encountered by our party are included in the list. Specimens were secured of each of the twenty species of mammals included in the report, but there are additional species known to occur on Vancouver Island, with which we did not meet.

The elk (*Cervus canadensis occidentalis*), formerly abundant over the entire island, is still to be found in many of the wilder parts, but it is strictly protected, and, lacking permission to take specimens, we made no attempt to penetrate its haunts. The English rabbit (*Oryctolagus cuniculus*) was introduced into Vancouver Island years ago (see Brown, 1868, p. 417), and I was told by several people of the occasional occurrence of rabbits as far north as the vicinity of Alberni, but we saw none ourselves. There are also species of bats that should occur here, which we did not secure.

In color descriptions Ridgway's *Nomenclature of Colors*, 1886 edition, has been the basis of comparison. All measure-

ments are in millimeters unless otherwise specified. For manner of taking measurements see Taylor (1911, pp. 206–207).

It is proper here to express our appreciation of the courtesies received from Mr. A. Bryan Williams, J.P., the Provincial Game Warden. He extended permission to our party to collect specimens of protected species of birds and mammals, gave us letters of introduction to local officials on Vancouver Island, and also aided us with information and advice.

ITINERARY AND DESCRIPTIONS OF LOCALITIES

VANCOUVER

On the mainland of British Columbia. While delayed here for several days, Miss Alexander and Miss Kellogg placed lines of traps on the outskirts of the city, April 20 to 22, and secured a few specimens of several species of mammals.

NANAIMO

A seaport on the east coast of Vancouver Island. Miss Alexander and Miss Kellogg were here April 23 and 24, and had a line of traps set out in the vicinity, and the writer had occasion to make several short visits to the town, on June 8, June 15–17, June 28–30, and September 28, 29.

PARKSVILLE

A small settlement on the east coast of the island, some twenty miles north of Nanaimo. Considerable land has been cleared in this region, and a good deal of farming is carried on. Miss Alexander and Miss Kellogg remained here from April 24 to May 7; and it was at this point that Despard joined the party.

LITTLE QUALICUM RIVER

Some eight or nine miles northwest of Parksville. Camp was established here from May 7 to 16.

FRENCH CREEK

A small stream about midway between Little Qualicum River and Parksville. Miss Alexander and Miss Kellogg camped about a mile from the mouth of the stream, remaining here from May 16 to 20.

ERRINGTON

A post-office about four miles west of Parksville. Camp was established on what is known as the Swain Ranch, some three miles west of the post-office. Miss Alexander and Miss Kellogg were here from May 20 to 27, and I returned and made a base camp at this same place at the end of the summer, August 29 to September 28. There are farms scattered at intervals of several miles, where there are small areas of cleared land, grain fields and pastures, the rest of the region (and by far the greater part of it) being covered with forest. The woods are not so dense, however, but that they can be traversed with comparative ease. The bulk of the forest is made up of conifers, of course, but there are thickets of alder and willow in the low spots, and a number of wild cherries in many places. There are also a good many madroñas scattered through the woods, some of them of large size. About Beaver Creek wharf (some six miles from Errington) there are a number of oaks, but I saw none more than a few hundred yards back from the shore. There are also large areas of low-lying marsh land, submerged in winter, but quite dry at the time we were there, covered with patches of willow and spiraea. This whole region, near the coast, is low and quite level and unbroken, but toward the southwest it rises into hills which culminate in high mountains, of which Mount Arrowsmith, some ten miles inland, is the highest and most conspicuous peak.

MOUNT ARROWSMITH

September 6 to 8 were devoted to the ascent and descent of Mount Arrowsmith. We drove from Errington to the east end of Cameron Lake, where the trail leads up the mountain to a long-abandoned mine. From this point, though there is no trail, traveling is fairly easy for the most part. We camped in a thicket just at the edge of the timber, and at the foot of the southernmost rocky peak. The extensive hillsides are covered with heather, intersected by numerous little streams descending from the surrounding snowbanks. Across the ridge from where we were camped was a little lake, with heather-covered slopes on all sides.

ALBERNI

On the west side of the island, at the head of Alberni Canal. We did no collecting in the immediate vicinity of the town, but used it as a base for the greater part of the summer. Our first camp in this region was at Beaver Creek, fifteen miles northwest of Alberni, and not to be confused with the harbor of the same name near Parksville, on the east coast, which we also visited. It is a common name in the northwest. This is a broad, level valley, containing one large stream and innumerable small ones, draining into the head of Alberni Canal. It is heavily timbered, mostly with Douglas fir and cedar, both of which attain a great size, while the creek beds and swamps are thickly grown up with willow and alder, with a dense undergrowth of devil's club, skunk cabbage, and other vegetation, and with many thickets of salmon-berry. A large part of the region has been burned over in years past, and there are innumerable tall, dead stumps standing everywhere, while the ground is strewn with logs and fallen trees.

In the immediate vicinity of Alberni much land has been cleared, and throughout the valley, between the town and our camp, there were cleared tracts, at gradually lengthening intervals, as the town was left behind. Many of these were deserted and the fields choked with rank second growth. Near the camp there were some extensive grassy meadows, intersected by numerous small streams, and on all sides there were many swamps, mostly caused by beaver dams.

About two miles to the east a low range of timbered hills arose somewhat abruptly. Above camp the valley rapidly narrowed, the ground became rocky and broken, with a rather steep ascent, and the road, terminating where we were camped, changed to a poorly defined trail winding through the hills. The forest became uniformly dense and animal life was consequently much less abundant and varied than in the more open country below.

In the town of Alberni, and in the immediate vicinity, birds were numerous, and of many species. The open fields and meadows, the partly cleared woods nearby, and the maples along

the roads, and shrubbery in the gardens, sheltered quantities of the smaller species, while the quiet waters of the harbor, with the streams flowing into it, attract many water birds.

The road between Alberni and the east coast, traversed by stage, lies mostly through forest, and a part of the distance (on the west side of the divide) through stands of prodigiously large trees. Even on a bright sunny day it is dark and gloomy in these woods, and the stillness is impressive. The ground is remarkably free from underbrush, and bird life almost totally lacking.

GOLDEN EAGLE BASIN

In the mountains about twenty miles southeast of Alberni. These mountains center in a tall, rocky peak, Mount Saunders (altitude 5500 feet), streams draining from it in all directions, and the various cañons terminating at the base of the peak in large circular amphitheatres, or "basins" as they are called (see pl. 2). The Golden Eagle Basin and the cañon draining from it (China Creek) were years ago the scenes of mining activities which entailed the building of a road into the mountains. The mines were failures and have long since been abandoned, and the road is now choked with vegetation and otherwise allowed to deteriorate, but it is still passable and our outfit was hauled over it without difficulty. Camp was established in one of the mine buildings through the courtesy of the caretaker in charge of the property, who resides there alone throughout the year.

The road into the mountains, ascending China Creek Cañon most of the way, passes through dense coniferous forests for its entire length, but the character of the landscape changes abruptly in the basin at its head. This is grown up with thickets of willow, elder and alder, interrupted with patches of grass and veratrum, while there are places where all vegetation has been destroyed by rock slides descending from the surrounding slopes and covering everything with gravel and boulders. The mountains rise precipitously on all sides except where the stream finds an outlet. There are tongues of scattered and dwarfed conifers on some of the ridges, but the slopes are clothed mostly with thickets of alder, salmon-berry and devil's club, with

many steep rock slides, or towering faces of sheer, unscalable rock. The higher slopes of the mountains, from about 4000 feet upward, are plentifully covered with heather and blueberries.

Mount Saunders forms the southwestern wall of the basin, while just north of this peak, connected by a comparatively low ridge and directly overlooking the site of our camp, is a lesser mountain, Hansen Height, altitude 4952 feet.

The cañon to the westward, King Solomon's Basin, is practically a replica of the one we were in, but somewhat smaller; the two cañons are separated by the ridge running up to Hansen Height and Mount Saunders, and come together at a point some four miles below our camp.

The summers are short at this altitude (Golden Eagle Basin is from 1900 to 2200 feet elevation). During our stay here (July 1 to 20), snow lay deep on the ground; most of the floor of the basin was covered; the ravines on the slopes held drifts thirty or forty feet deep, and there was snow everywhere on the higher peaks. The veratrum and grass were just pushing up, and when we left, the willows and alders had not yet fully leaved out, while the salmon-berry bushes were still in blossom, though we had eaten berries in the lowlands six weeks before.

MOUNT DOUGLAS

The highest point on the ridge extending from Mount Saunders to the westward of King Solomon's Basin. The summit (4245 feet) is gently rounded, and comparatively easy of access, once the ridge is attained, but the slopes from the cañon bottom to the ridge are steep and brush-covered, presenting a stiff climb. The ridge and slopes above are quite open, covered with moss and heather, and with many groves of stunted conifers. We found here two little lakes, one about an acre in extent, the other, just below, about half as large, both fed by surrounding snow banks. At the upper end of the lakes these drifts were from twenty to thirty feet high, rising sheer from the water like miniature glaciers. From the summit both coasts of the island can be seen.

Though the weather was clear and sunny the air was decidedly chilly at this height, and ice formed on the water in the night. Birds were abundant, much more so than in the

cañons below, but we failed to find any of the smaller species of mammals. A string of mouse traps was set out, but with no results, and I could find no runways or any other indication of the presence of either mice or shrews.

Despard visited the mountain on July 3, and again July 7 to 9, and he and I together were there July 14 to 16.

NOOTKA SOUND

There is hardly a spot in the Pacific Northwest of greater historical interest than this remote and almost forgotten inlet on the west coast of Vancouver Island. The history of British Columbia practically begins with Captain Cook's discovery of the bay in 1778, while for years afterwards it was the objective point of most of the traders and explorers in the region, and was regarded as the strategic key to the whole northwest coast. The naturalist's interest in the spot is due to the fact that some of the early explorers brought back with them specimens of animals and plants which were new to the scientists of the period, and many species in various branches of natural history were described from examples taken there.

With the opening up of more promising regions, and the decline of the fur trade, Nootka Sound ceased to be of political or commercial importance, and today the little Indian village of Friendly Cove is probably in many respects very similar to what it was when Captain Cook anchored nearby in the spring of 1778, or as John Jewitt saw it during his two years' captivity there in 1803–5. Except for the infrequent visits of the coasting steamer that runs from Victoria up the west coast, and an occasional fishing schooner driven in by stress of weather, the harbor is abandoned to the fleet of canoes belonging to the village; the only white man residing there at the time of our visit was the storekeeper, though there is a mission there and a priest during the winter months.

Nootka Sound is enclosed between Vancouver Island and Nootka Island, and the village of Friendly Cove lies on a little spit projecting from the southeastern extremity of the latter. This peninsula is unforested, level and grass-covered, affording a splendid site for the town, while a string of rocky islets extend-

ing to the eastward, at right angles with the line of the beach, gives the shelter that forms the cove. On the sheltered side, where the town is placed, there is a strip of beach several hundred yards long, composed of coarse gravel in which one sinks ankle deep at every step, but a beach of any sort is something to be appreciated on this rocky coast. On the exposed side of the island is another strip of beach some two miles long, also composed mainly of the same coarse gravel, though in one or two places there are stretches of firm sand.

At the north end of the outer beach, about two miles from the village, is a large lagoon, opening into the sea and affected by the tides, but with freshwater streams flowing into it at the upper end, and with grassy flats on all sides. About half a mile behind the village, entirely surrounded by the forest, is a shallow freshwater lake, several acres in extent. This pond is described by Jewitt, in the narrative of his captivity, but though he speaks of it as being at that time surrounded by open woods, with no underbrush, at present the banks are so overhung and hidden by willows and salal that it is only at occasional intervals that the water's edge can be reached. Most of our collecting was done about this lake and along the edge of the timber on the outer beach. The whole island is densely covered with good-sized timber and impenetrable underbrush, the salal, devil's club, and other brush forming impassable thickets higher than a man's head.

There are several large inlets opening from the sound, Muchalat Arm extending due east, Tlupana Arm, northeast, and the Tahsis Canal, due north. We ascended the Tahsis Canal to its head, where we established camp, about twenty-five miles from Friendly Cove. The shores of the canal, as elsewhere about the sound, are rocky and abrupt, except for one or two level spots occupied by Indian shacks, but at the extreme head of the inlet there are some rather extensive grassy flats, and two valleys containing large streams. There is an abandoned marble quarry at this point, and we found a solitary trapper residing here, with whom we made our home.

This proved to be a difficult place to work, for animal life was scarce, and the forests gloomy and all but impassable. The

grassy meadows, though attractive to the eye, were deceptive, for the rank grass was more than waist high, and concealed innumerable logs, stumps and pitfalls, while narrow winding gullies intersected the flats in all directions. There was a cluster of Indian houses here, unoccupied during the summer months, and around a spring nearby were dense thickets of elder, salmonberry and other brush.

There is said to have been formerly a trail from the head of the Tahsis Canal across the island to Alert Bay, on the east side, but we were unable to find any trace of it, though the trapper with whom we were camping had blazed a trail over a portion of the ground it was supposed to traverse.

The steamer on which we departed having occasion to ascend the Muchalat Arm about twelve miles, gave me an opportunity of seeing this branch of the sound, which, like the Tahsis, has abrupt, rocky sides, with rough, timber-covered hills surrounding.

We arrived at Friendly Cove on the evening of July 23, and on the following day traveled up the Tahsis Canal, where we remained until August 2. August 3 to 11 were spent at Friendly Cove. While here we were the recipients of many courtesies from Mr. H. L. W. Smith, the storekeeper. When we shifted camp from the Tahsis Canal he came in his canoe from Friendly Cove, twenty-five miles, to assist in the moving; he provided us with a cabin in which to stay at the latter point, and gave us all the information and assistance possible. In short, he did everything in his power to render our stay pleasant and profitable, and I gladly take this opportunity of expressing my appreciation of his acts.

GREAT CENTRAL LAKE

A narrow sheet of water, twenty-four miles in length, the lower end of which lies twelve miles northwest of Alberni. The lake is surrounded by hills and mountains, and though there are occasional stretches of rocky beach, the shores are precipitous for the most part, the only level ground being at the two ends. At the upper end, where we camped, several large streams empty, and at their mouths are limited areas of grassy flats, but so grown up with willows and underbrush as to be

impassable. The forest growth is dense, but there is comparatively little underbrush, so the woods are fairly easy to traverse. Scattered along the north shore of the lake I noticed several madroñas at different points, the only place on the west side of the island where we saw this tree; there are none around Alberni, none nearer than the east end of Cameron Lake. We were at Great Central Lake from August 17 to 26.

DELLA LAKE

In the high mountains, some twelve or fifteen miles northwest of the upper end of Great Central Lake. From our camp at the latter point we made a short trip here in search of ptarmigan, the country being so rough that we were unable to transport enough camp equipage to enable us to remain more than a day or two; in fact it is a sufficiently hard trip without any load. Most of the way the trail leads through thick woods, over rolling country, gradually ascending, but with no very steep grades. There are a number of streams to be crossed over very precarious bridges, some of them at dizzy heights above the water. One of these, composed of two fir trees felled across a narrow gorge, with split slabs laid across about three feet apart, spanned a waterfall, dropping below a sheer seventy or eighty feet; and the roar of the water, together with the trembling of the rickety structure formed a combination that would be decidedly unnerving to a person inclined to be dizzy. The hard climb came at the farther end of the trail, which led to the base of a towering rocky cliff, over which a stream tumbled in a series of tremendous falls. A fragment of rotten rope dangling from a ledge at one side showed where the "trail" ascended, and the climb (of about 2000 feet) was a series of scrambles up the face of the cliff, with the occasional aid of ropes or leaning trees, and with short intervals of rocky slides where walking was possible. Our dog was unable to follow, and remained at the foot of the trail. Arrived on top we found ourselves in a rocky, bowl-shaped valley, nearly filled by the lake whose waters cascaded over the cliff we had ascended, while on every other side snow-covered mountains rose precipitously, some scrubby timber on their heather-covered lower slopes, but the summits

snowy and barren of vegetation. The lake itself was more than half filled with masses of snow and ice, and probably remained so throughout the rest of the summer.

A view from a mountain top in this region, even in midsummer, gives one the impression that the island is mostly snow and glaciers, so wintry is the aspect, while from the warm valleys below, looking toward the mountains, there is but little of this to be seen.

About Della Lake are several mining claims, the occasion of the trail we had followed, none of which have been worked with any profit. Our visit to this point consumed three days, August 19 to 21.

THE BIRDS

CHECK-LIST OF THE BIRDS

1. Æchmophorus occidentalis (Lawr.)
2. Podilymbus podiceps (Linn.)
3. Gavia immer (Brünn.)
4. Brachyramphus marmoratus (Gmel.)
5. Cepphus columba Pall.
6. Larus philadelphia (Ord)
7. Mergus americanus Cass.
8. Lophodytes cucullatus (Linn.)
9. Anas platyrhynchos Linn.
10. Nettion carolinense (Gmel.)
11. Charitonetta albeola (Linn.)
12. Histrionicus histrionicus (Linn.)
13. Ardea herodias fannini Chapm.
14. Grus canadensis (Linn.)
15. Rallus virginianus Linn.
16. Pisobia minutilla (Vieill.)
17. Ereunetes mauri Cab.
18. Actitis macularius (Linn.)
19. Ægialitis semipalmata (Bonap.)
20. Dendragapus obscurus fuliginosus (Ridgw.)
21. Bonasa umbellus sabini (Dougl.)
22. Lagopus leucurus leucurus (Swains.)
23. Phasianus torquatus Gmel.
24. Columba fasciata Say
25. Zenaidura macroura carolinensis (Linn.)
26. Cathartes aura septentrionalis Wied
27. Circus hudsonius (Linn.)
28. Accipiter velox (Wils.)
29. Astur atricapillus striatulus Ridgw.
30. Buteo borealis calurus Cass.
31. Haliaëëtus leucocephalus alascanus Towns.
32. Falco columbarius columbarius Linn.
33. Falco columbarius suckleyi Ridgw.
34. Falco sparverius sparverius Linn.
35. Pandion haliaëtus carolinensis (Gmel.)
36. Asio flammeus (Pont.)
37. Otus asio kennicotti (Elliot)
38. Bubo virginianus saturatus Ridgw.
39. Glaucidium gnoma californicum Sclater
40. Ceryle alcyon caurina Grinn.
41. Dryobates villosus harrisi (Aud.)
42. Dryobates pubescens gairdneri (Aud.)
43. Sphyrapicus varius ruber (Gmel.)

44. Phlocotomus pileatus abieticola (Bangs)
45. Colaptes cafer saturatior Ridgw.
46. Chordeiles virginianus virginianus (Gmel.)
47. Cypseloides niger borealis (Kennerly)
48. Chaetura vauxi (Towns.)
49. Selasphorus rufus (Gmel.)
50. Nuttallornis borealis (Swains.)
51. Myiochanes richardsoni richardsoni (Swains.)
52. Empidonax difficilis difficilis Baird
53. Empidonax trailli trailli (Aud.)
54. Empidonax hammondi (Xantus)
55. Cyanocitta stelleri stelleri (Gmel.)
56. Perisoreus obscurus obscurus Ridgw.
57. Corvus corax principalis Ridgw.
58. Corvus brachyrhynchos caurinus Ridgw.
59. Agelaius phoeniceus caurinus Ridgw.
60. Sturnella neglecta Aud.
61. Euphagus cyanocephalus (Wagl.)
62. Pinicola enucleator flammula Homeyer
63. Carpodacus purpureus californicus Baird
64. Loxia curvirostra minor (Brehm)
65. Spinus pinus (Wils.)
66. Calcarius lapponicus alascensis Ridgw.
67. Passerculus sandwichensis savanna (Wils.)
68. Zonotrichia leucophrys gambeli (Nutt.)
69. Zonotrichia leucophrys nuttalli Ridgw.
70. Zonotrichia coronata (Pall.)
71. Spizella passerina arizonae Coues
72. Junco oreganus oreganus (Towns.)
73. Melospiza melodia rufina (Bonap.)
74. Melospiza lincolni gracilis (Kittl.)
75. Passerella iliaca fuliginosa Ridgw.
76. Passerella iliaca insularis Ridgw.
77. Passerella iliaca townsendi (Aud.)
78. Pipilo maculatus oregonus Bell
79. Zamelodia melanocephala (Swains.)
80. Piranga ludoviciana (Wils.)
81. Progne subis hesperia Brewst.
82. Hirundo erythrogastra palmeri Grinn.
83. Tachycineta thalassina lepida Mearns
84. Stelgidopteryx serripennis (Aud.)
85. Bombycilla cedrorum Vieill.
86. Vireosylva olivacea (Linn.)
87. Vireosylva gilva swainsoni (Baird)
88. Lanivireo solitarius cassini (Xantus)
89. Vermivora celata lutescens (Ridgw.)
90. Dendroica aestiva rubiginosa (Pall.)
91. Dendroica coronata hooveri McGregor
92. Dendroica auduboni auduboni (Towns.)

93. Dendroica townsendi (Towns.)
94. Oporornis tolmiei (Towns.)
95. Geothlypis trichas occidentalis Brewst.
96. Wilsonia pusilla pileolata (Pall.)
97. Anthus rubescens (Tunst.)
98. Cinclus mexicanus unicolor Bonap.
99. Thryomanes bewicki calophonus Oberh.
100. Troglodytes aëdon parkmani Aud.
101. Nannus hiemalis pacificus (Baird)
102. Certhia familiaris occidentalis Ridgw.
103. Sitta canadensis Linn.
104. Penthestes rufescens rufescens (Towns.)
105. Regulus satrapa olivaceus Baird
106. Myadestes townsendi (Aud.)
107. Hylociehla ustulata ustulata (Nutt.)
108. Hylociehla guttata nanus (Aud.)
109. Planesticus migratorius caurinus Grinn.
110. Ixoreus naevius naevius (Gmel.)
111. Sialia mexicana occidentalis Towns.

GENERAL ACCOUNTS OF THE BIRDS

Æchmophorus occidentalis (Lawrence)

Western Grebe

Seen only in the harbor at Beaver Creek wharf (near Parksville) on September 28, where they were abundant.

Podilymbus podiceps (Linnaeus)

Pied-billed Grebe

Only a single bird secured, at the head of Great Central Lake, August 22 (no. 15553). This bird is in first winter plumage, with the throat and sides of the head and neck variously streaked with dusky markings. Its stomach was filled with a mass of what appeared to be its own feathers.

Gavia immer (Brünnich)

Common Loon

Two seen in a little mountain lake on the west slope of Mount Douglas on July 8. Quite common at the head of Tahsis Canal during the last week in July. At Friendly Cove, August 2 to 11, one was seen daily in a little lake in the woods. Every day at precisely the same time it left the lake, circled about once or twice, and then flew out to sea, calling as it went. I watched it

repeatedly, and it invariably took the same line over the trees, nor did it vary its time of departure more than five minutes. At the head of Central Lake, August 18 to 23, loons were seen and heard daily.

Brachyramphus marmoratus (Gmelin)

Marbled Murrelet

A few seen from the steamer on the west coast of the island between Port Alberni and Nootka, July 22 and 23, and August 11 and 12. Common at the head of the Tahsis Canal during the last week in July, and in the vicinity of Friendly Cove, August 3 to 11.

Cepphus columba Pallas

Pigeon Guillemot

A single bird was seen in the harbor at Friendly Cove on August 3.

Larus philadelphia (Ord)

Bonaparte Gull

Several seen August 22 at the head of Central Lake, evidently migrating. They appeared late in the afternoon and remained until dark, circling about and feeding on the surface of the water.

Large gulls were seen from the steamer at various points between Alberni and Nootka Sound, and along the outer beach at Friendly Cove, but they were all birds in various stages of the immature plumage, and seen at too great a distance to permit of their identification.

Mergus americanus Cassin

American Merganser

A female with a brood of downy young was seen in the swift rushing stream by our camp at Beaver Creek, on the evening of June 23. They gathered together on the river bank, evidently preparing to spend the night; in the morning they were gone.

Several broods of half-grown young, attended by the parent birds, were seen in the several streams at the head of the Tahsis Canal, the end of July, and individuals were observed in the lake at Friendly Cove, at various times from August 2 to 10.

Lophodytes cucullatus (Linnaeus)

Hooded Merganser

A single bird, an adult female, taken at Errington, May 23 (no. 15552).

Anas platyrhynchos Linnaeus

Mallard

A nest containing nine eggs was discovered by Miss Alexander at Errington, on May 21. On May 24 the nest was deserted and the eggs gone, though the old bird was still seen in the vicinity. Four were seen swimming together on several occasions at Central Lake, August 18 to 22. At Errington on September 2 and 22 flocks of eight or ten were flushed from a little lake in the woods.

Nettion carolinense (Gmelin)

Green-winged Teal

Small flocks and some single birds seen at Errington during the latter half of September. Two were shot on September 22, and the skeleton of one of them preserved (no. 15549).

Charitonetta albeola (Linnaeus)

Bufile-head

Only two females, seen at Della Lake, August 20.

Histrionicus histrionicus (Linnaeus)

Harlequin Duck

Three seen in the Tahsis Canal, Nootka Sound, on July 24.

Ardea herodias fannini Chapman

Northwestern Blue Heron

Apparently fairly common, as a few individuals were seen at all suitable points visited. Miss Kellogg saw one on the Little Qualicum River, May 10, and secured an adult female at the same place, May 13 (no. 15554). I saw one feeding on the beach between Nanaimo and Parksville on June 8. In the vicinity of our camp at Beaver Creek they were occasionally seen flying overhead or feeding about the ponds and streams, and an adult male

was secured on June 19 (no. 15555). Several were seen from the steamer at different points on Clayoquot Sound, July 23. A number were seen at different times from July 24 to August 11, at points on the Tahsis Canal and in the vicinity of Friendly Cove. Two full-grown juvenals were secured, one at the head of Tahsis Canal, July 30 (no. 15556), and one at Friendly Cove, August 4 (no. 15557).

The four specimens obtained are indistinguishable in color and markings from examples from southeastern Alaska, but the two adults are a trifle larger than any from that region. Their measurements are as follows:

No.	Sex	Wing	Tarsus	Middle toe and claw	Culmen
15555	♂	532	174	138	149
15554	♀	493	146	113	123

Grus canadensis (Linnaeus)

Little Brown Crane

On September 24 and on several occasions during the next few days, flocks of cranes, presumably of this species, were seen flying southward. On September 27 a flock of twenty-five birds lit in a grain field near our camp, and remained there, feeding in the stubble, until late in the afternoon, when they were frightened away.

Rallus virginianus Linnaeus

Virginia Rail

A pair of adults and a downy juvenal secured in a swamp near Errington on May 19 were the only ones of the species seen at this point. At Beaver Creek there was a small swamp near our camp where the rails appeared to be quite abundant. Specimens were secured and others seen or heard calling at various times. Six specimens in all were preserved (nos. 15558–15563).

Pisobia minutilla (Vieillot)

Least Sandpiper

Seen only at Nootka Sound. A small flock was observed on the beach at Friendly Cove, July 24. At the head of Tahsis Canal, July 25 to August 1, single birds appeared on the mud

occasionally; on the outer beach at Friendly Cove, August 3 to 11, small flocks were seen on numerous occasions. One specimen was preserved (no. 15564), immature male, Friendly Cove, August 3.

Ereunetes mauri Cabanis

Western Sandpiper

Met with only at Nootka Sound, a few scattered individuals at the Tahsis Canal, and small flocks on the outer beach at Friendly Cove, July 24 to August 11. Two specimens were preserved (nos. 15566, 15565), an adult male and female, in worn breeding plumage, the latter beginning to molt into the winter garb.

Actitis macularius (Linnaeus)

Spotted Sandpiper

One only, seen at the head of the Tahsis Canal, July 26.

Ægialitis semipalmata (Bonaparte)

Semipalmated Plover

A single bird seen on the Tahsis Canal, July 26. At Friendly Cove, August 3 to 11, small flocks and single individuals were occasionally seen on the outer beach. One specimen was preserved, an immature male, Friendly Cove, August 3 (no. 15567).

Dendragapus obscurus fuliginosus (Ridgway)

Sooty Grouse

Common at most of the points visited. At Parksville and Errington many were seen and specimens secured in April and May. At Beaver Creek, in June, though not common, they were met with on various occasions, and toward the end of the month several broods of downy young were seen. A nest containing six eggs was found by Despard on June 3, placed close by the road, and discovered through the female flying up as he passed. As the nest was apparently deserted the next day, he took the six eggs it contained (no. 1075). In the Golden Eagle and King Solomon basins females with broods of young were seen on various occasions during July.

Nootka Sound was the one point visited where the species was

not found. It probably does occur there but is certainly uncommon, as the storekeeper at Friendly Cove had not seen one during a residence of two years. At Della Lake (altitude about 3000 feet), August 20, feathers and droppings were noted at various points, but no grouse were seen.

The species is locally migratory, descending into the valleys during the breeding season, and retreating into the higher mountains at the end of the summer. The old males go first, beginning to leave about the time the females are bringing their young from the nest. At Beaver Creek a few still lingered through June and could occasionally be heard hooting. In the mountains south of Alberni, in July, no old males were seen at the bottoms of the basins, or in the cañons, where females with young were frequently met with, but on the higher slopes and the summits of the surrounding ridges they were quite abundant. At the top of Mount Douglas (altitude about 4200 feet) several were heard hooting July 14 to 16.

At Errington, early in September, sooty grouse were abundant and gathered in flocks, usually of from six to ten individuals, though as many as fifteen were seen in one gathering. At this time there were no males in the lowlands, these flocks being in all probability composed usually each of a female with her brood; but a trip to the summit of Mount Arrowsmith, September 6 to 8, disclosed the presence of the cock birds in numbers everywhere on the higher slopes of the mountains. About the second week in September the others began to follow, and they soon became quite scarce in the lowlands. By the end of the month but very few remained.

This seasonal movement is extraordinary. For a bird to descend into the lowlands during the summer, and then to retreat to the bleak, exposed ridges at the advent of cold weather seems contrary to all expectation and is the opposite of the usual migratory movement of the birds of the high mountains. Neither does it seem to be analogous to the autumnal dispersal of birds, in which many lowland species ascend to high altitudes. Although under primitive conditions this would seem to be anything but an advantageous move on the part of the bird, at the present time it undoubtedly does save the lives of many grouse

which would otherwise be killed by sportsmen; for though they are abundant about the farms and on the outskirts of the towns during the breeding season, at the beginning of the shooting season most of them have withdrawn to the wilder and more inaccessible regions.

The male birds collected are indistinguishable from comparable specimens from southeastern Alaska, but the females from the two regions show conspicuous differences of coloration. The Alaska birds are of a decided reddish tone as compared with the gray and brown of Vancouver Island specimens. This is especially noticeable on the dorsal surface of the body, on the head and neck, and on the tarsi. It appears to be a constant difference between females from the two regions, the only Alaska specimens showing an approach toward the other type of coloration being individuals in very worn plumage, which condition is probably largely accountable for the departure from the usual character. No Vancouver Island specimens are of the reddish color of the Alaska birds.

Eighteen specimens were preserved (nos. 15547, 15568–15584): seven adult males, seven adult females, one immature male (molting from juvenal into first winter plumage), two in natal down, and one adult female saved as a skeleton.

Bonasa umbellus sabini (Douglas)

Oregon Ruffed Grouse

Common at many of the points visited, but apparently confined to low altitudes. About Parksville and Errington on the east coast, and about Alberni, near the center of the island, it was abundant in the woods. At Nootka it was uncommon, all that were seen being two old males, one at Friendly Cove and one at Tahsis Canal, and a female with a brood of young at the latter place. There were none in the Golden Eagle and King Solomon basins, nor on the surrounding mountains. A number were seen between Alberni and Central Lake, but at the head of the lake and in the mountains beyond no ruffed grouse were encountered. Thus on Vancouver Island it appears to be a bird of the lowlands. At Errington, in September, they were abundant in the woods, in small flocks, probably family groups,

and frequenting dense thickets of willows or crab-apples. They lay close and were hard to flush without a dog, when startled usually flying up to some low limb, where they remained in utter disregard of approaching men or dogs.

The male birds were heard drumming about Parksville and Errington in April and May, and at Beaver Creek in June; but not thereafter. A female shot near Parksville on April 27 had an egg in the oviduct. At Beaver Creek broods of downy young began to appear during the second week in June, and were seen daily thereafter, for the species was numerous at this point. The old birds were fearless in defense of their broods, and often the first intimation of the proximity of a grouse family was the sudden onslaught of the perturbed mother, who did not hesitate to hurl herself at any intruder, while her brood effaced themselves in the underbrush. Very young birds usually lay perfectly still when alarmed, and, if visible, suffered themselves to be picked up, but as soon as their wings could support them they flew to some distance when startled.

September birds were all molting, and it was not until near the end of the month that any were secured with the rectrices grown out to their full length. Most of the immature birds taken during this month were stubby-tailed and with the head and neck still mostly in juvenal plumage. A young one shot on September 4 was still almost entirely in the juvenal plumage.

The dichromatism of the species is very apparent in the series collected, the gray and the red-colored birds being conspicuously different. Those in the gray phase are quite uniform in color and markings, but the reddish birds show considerable variation. The former all have black ruffs, and gray tails with a black subterminal band. Of the reddish birds some have red ruffs, some black, and others are variously intermediate. Some have a gray tail with a red band, some a red tail with a dark band, and one a red tail with a darker red band. These different styles of coloration are not indicative of age, sex, or season, for both phases are represented among adults and immatures of both sexes.

The stomachs and crops of birds collected in September contained some berries, but were filled for the most part with fern leaves and clover. A young bird shot in a tidal meadow on the

Tahsis Canal had its crop filled with small snails swallowed whole.

Twenty-two specimens were secured (nos. 15585–15606): six adult males, three adult females, two immature males, three immature females, two females in juvenal plumage, and six birds in the natal down.

Lagopus leucurus leucurus (Swainson)

White-tailed Ptarmigan

Ptarmigan probably occur on all the higher mountains, where favorable conditions prevail, but they do not appear to be numerous. We searched for them at various points, with but moderate success. The regions they inhabit are so extremely wild, rugged and difficult of access that we were never able to conduct as thorough a hunt as I should have liked. In each case it meant a trip of several days from our base camp, over mountains so steep and rough that we were able to carry but a very limited amount of supplies, even the bedding being left behind, while twice our hunts were brought to an abrupt end by sudden storms that forced us to descend hurriedly to the lowlands.

The caretaker at the Golden Eagle Mine told us that he had occasionally seen ptarmigan on the high surrounding ridges, but we failed to secure any at this point. On July 11 Despard saw one on a high ridge south of Mount Saunders. This appeared to be a female, and from its actions it undoubtedly had a brood of young near by. Numerous feathers and droppings were noted in the vicinity, but a later visit to the place was unproductive of results, no ptarmigan being seen.

The next place where we had an opportunity of hunting them was in the high mountains northwest of the head of Great Central Lake. Here, on the afternoon of August 20, a small flock was encountered on a steep mountain side overlooking Della Lake, at an estimated altitude of about 4000 feet, and three birds secured. The next morning the remainder of the flock was found again at the same spot, and three more were shot. This covey was composed of nine individuals, probably a pair of adults with their brood. They were found at the lower edge of deep snow banks which cover all these high ridges, where numerous small, terrace-like breaks in the steep, rocky hillside held sufficient soil

to support a scanty growth of grass and heather. The melting snow kept all these places saturated, the water trickling over the rocks. The numerous, deep gulches seaming the mountain side at frequent intervals were filled with snow, the depth of which we had no means of ascertaining, but in places faces of snow banks were exposed, forty feet high or more.

The birds were wild and difficult to approach, scattering to some distance when flushed, and alighting on projecting rocks where approaching danger could be watched. There they stood observant, with outstretched necks and nervously twitching tails, uttering an occasional cackle.

This was the only flock seen here, and before we could hunt farther the weather suddenly turned cloudy, and threatening fog banks settled over the peaks, making traveling dangerous over the slippery, dripping ledges; so, while we could still distinguish directions and landmarks, we hastily descended the mountain.

Our last effort to secure ptarmigan was made on Mount Arrowsmith, September 6–8. They are known to occur on this mountain, and I talked with people who had seen them there, but we failed to find any. The greater part of a day was spent hunting in wind, rain and storm, but with no results, and as, after a wretched night, the storm showed no signs of abating, we gave it up and descended the mountain empty-handed. We tramped over large areas of open, heather-covered slopes well adapted to the species, and with a little more time and under somewhat more favorable circumstances there is no doubt but that they could be found there.

The six specimens secured on August 20 and 21 (nos. 15607–15612) are all young birds, four males and two females, no adults being obtained, unfortunately. They are largely in the intermediate plumage between the juvenal and the pure white winter plumage, that designated by Dwight (1900, p. 149) as "first winter plumage, preliminary." This has replaced the soft juvenal plumage on the head, neck, upper breast, and to some extent on the back. The white winter plumage is beginning to appear on the wings, some partly grown lesser wing coverts and the two outer primaries being white. Head, neck, and upper

breast are coarsely mottled, black and white, the feathers being barred with these colors in about equal amounts, and with a little ochraceous intermixed. Abdomen, white, suffused with dusky. Flanks barred with pale ochraceous and black. The general appearance is of a gray colored bird, with a suffusion of buffy on the back. The six specimens are almost precisely alike, having advanced to the same stage in the molt almost feather for feather.

The lack of comparable specimens prevents the comparison of these with mainland examples of *leucurus*. The conditions surrounding the Vancouver Island white-tailed ptarmigan are very similar to those under which *Lagopus rupestris dixoni* of southeastern Alaska has developed dissimilarities from true *L. r. rupestris* of the interior, and it seemed natural to suppose that there might be a humid coast race of *leucurus* perceptibly different from the mainland form. The determination of this, however, will have to await the obtaining of additional material. Through the kindness of Mr. Frank M. Chapman, Curator of Ornithology, American Museum of Natural History, I have been enabled to compare my birds with some young of *Lagopus l. peninsularis* from the Kenai Mountains, Alaska. These are not so far advanced in the change into the transition plumage, but in the comparable parts there is surprisingly little difference between the two series. On the head and neck, however, where the juvenal plumage has been discarded, the Vancouver Island birds seem to be more purely gray, that is, more decidedly black-and-white-barred, and with less admixture of ochraceous, than is the case with any other white-tailed ptarmigan at hand, either adult or young.

Phasianus torquatus Gmelin

Ring-necked Pheasant

Introduced in the southern part of Vancouver Island, where it appears to be increasing in numbers and extending its range. Miss Kellogg saw one at French Creek, May 18, and a number were observed about Errington in September. We were told that there were a few in the vicinity of Alberni, but none was encountered there by any member of our party. At Errington they were usually seen in the grain fields, but took refuge in the timber when flushed. Unlike the native grouse they were

exceedingly wary and difficult to approach. When startled they flew long distances, lit in dense cover, and probably ran, for I was never able to flush one a second time. Several broods were seen, never composed of more than four or five young. One specimen was secured (no. 15613), a juvenal male, about half grown, shot on September 1.

Columba fasciata Say

Band-tailed Pigeon

Common in the vicinity of Parksville and Errington in April and May, when several specimens were taken. On May 24 Miss Alexander saw near Errington a flock numbering about a hundred birds. Common at Beaver Creek but no longer gathered in flocks, and probably breeding in the vicinity, though the females secured did not appear to be breeding birds. They frequented certain patches of swampy lowlands, feeding on salmon-berries and gooseberries, and were vigilant and hard to approach. At the first alarm they took refuge in the tops of the numerous tall dead fir trees standing everywhere in the valley, where they were quite safe from molestation.

In the Golden Eagle basin two birds seen on July 12 were the only ones noted, but the caretaker at the mine told us that later in the summer, when the berries were ripe at this altitude and about exhausted in the lowlands, the pigeons became quite numerous for a few weeks.

At Nootka Sound but a single bird was seen, at the head of the Tahsis Canal on July 27. At Errington in September only occasional small flocks or single birds were seen, and I was told that they departed altogether during the winter months. A single bird was seen near the summit of Mount Arrowsmith on September 7.

Seven specimens were secured (nos. 15614–15620), two males and five females, all adult.

Zenaidura macroura carolinensis (Linnaeus)

Mourning Dove

I saw a single bird in the town of Alberni on the evening of June 14, feeding in the road near the hotel. The species was not met with elsewhere during the summer.

Cathartes aura septentrionalis Wied

Turkey Vulture

Common during the summer months in the southern part of Vancouver Island. I saw it in the vicinity of Alberni on numerous occasions in June and July, usually soaring about over the neighboring tide flats. At our camp on Beaver Creek, fifteen miles to the northward, it was seldom observed, probably not more than five or six being noted during the month we remained there. It apparently remains in the warmer lowlands, for none was seen in any of the mountain regions we visited. Neither were any observed at Nootka Sound.

Miss Alexander observed it at Errington in May, as many as ten being seen at once on May 25, and at the same place, in September, I saw some almost daily.

Circus hudsonius (Linnaeus)

Marsh Hawk

Seen only at Errington, where, during September, several were observed evidently migrating.

Accipiter velox (Wilson)

Sharp-shinned Hawk

Apparently of rather rare occurrence in summer, as we met with it on very few occasions until the fall migration had begun. Miss Alexander saw one at Errington on May 26. Several were noted in the Golden Eagle and King Solomon basins during our stay there, and two secured on July 17, one an immature female, the other an adult male. The adult was one of a pair that suddenly appeared, circling over our heads as we were walking along a trail, screaming and scolding at us most vociferously. Although their actions intimated the proximity of a brood of young ones, we were unable to find them.

Several were seen at the head of the Tahsis Canal, the end of July, and one at Friendly Cove the first week in August. At Errington, during September, they were seen on various occasions, but were never abundant. At the last-mentioned point one was observed in pursuit of a flock of ruffed grouse, and

another was seen to catch a Savannah sparrow late one evening, when it was almost dark.

Three specimens were secured (nos. 15621–15623), an adult male and two immature females.

Astur atricapillus striatulus Ridgway

Western Goshawk

Seen only at Errington, in September. First noted on September 13, and subsequently observed on several occasions, though they never became at all numerous. Two secured on September 15 (nos. 15624, 15625), both immature males, and both in pursuit of poultry when they were shot. The species has an evil name as a chicken hawk among the ranchers of the region.

Buteo borealis calurus Cassin

Western Red-tailed Hawk

Seen on but two occasions during the summer, one at Beaver Creek, June 19, and another at Errington, September 20. Both were adults, as the red tail was distinctly visible as they flew, though neither ventured within shotgun range.

Haliaeëtus leucocephalus alascanus Townsend

Northern Bald Eagle

Fairly common on or near the coast; much less abundant inland. Seen in the vicinity of Parksville and Errington in May, and again in September. A few observed in Alberni valley in June. A number were seen from the steamer at various points on the west coast between Port Alberni and Nootka. On the Tahsis Canal and at Friendly Cove, July 24 to August 11, one or two were observed almost daily. A single bird was seen circling about over the summit of Mount Arrowsmith, September 7.

Falco columbarius columbarius Linnaeus

Pigeon Hawk

One specimen, a male, apparently immature, secured at Errington, September 16 (no. 15626), is typical *columbarius*. Pigeon hawks were quite abundant in this vicinity during September, but the difficulty of distinguishing between *columbarius*

and *suckleyi* in life made it impossible to determine the proportional abundance of the two subspecies.

Falco columbarius suckleyi Ridgway

Black Pigeon Hawk

Seen only after the autumnal migration had begun. The first was noted at Central Lake, on August 22, in pursuit of a swallow. Another was observed near Cameron Lake on August 28, and thereafter, during the remainder of my stay on the island, they were seen daily in the vicinity of Errington and Parksville.

In habits and actions they were exactly like pigeon hawks as observed elsewhere. The cleared fields seemed to attract them and they were fond of sitting in elevated, exposed positions while at rest, and of sweeping along the edge of the brush, close to the ground, while hunting. They were frequently observed pursuing flocks of Steller jays, but were never seen actually to seize one, while the moment a hawk lit he was sure to be surrounded by the jays and pestered until he moved away.

Five specimens were secured (nos. 15627–15631), all taken at Errington during September. Two are males and three females, and apparently none are in fully adult plumage. They are all very uniform in appearance, sooty above, and very heavily marked below, as compared with true *columbarius*. In all, the transverse bars on the tail feathers are reduced to disconnected spots; in one (no. 15627) the middle rectrices and the outer webs of the others are unmarked.

Falco sparverius sparverius Linnaeus

Sparrow Hawk

Fairly common at several of the points visited. One was seen by Miss Kellogg at French Creek, April 28, and one by Miss Alexander at the Little Qualicum River, May 9, while a number were observed at Beaver Creek during June. At Errington they were common early in September, but had nearly all disappeared before the end of the month. Not met with at Nootka Sound, nor elsewhere in the higher mountains.

Sparrow hawks were usually seen about patches of cleared land, never in the thick woods; and the dense and uninterrupted

nature of the forest on the west coast of the island probably accounts for the absence of the species from that region.

Five specimens were preserved (nos. 15548, 15632–15635), four as skins and one as a skeleton.

Pandion haliaëtus carolinensis (Gmelin)

Osprey

At Friendly Cove there was at least one pair of ospreys, the birds being seen daily circling overhead. Others were observed from the steamer at points on the west coast between Friendly Cove and Port Alberni. One passed over the boat in Clayoquot Sound, July 23, close enough for me to see that it was carrying a branch in its claws, as if nest building, though the season is certainly unusual.

The only others noted were two single birds seen, one near Parksville, June 8, and the other at Central Lake, August 22.

Asio flammeus (Pontoppidan)

Short-eared Owl

A female only, secured at Errington on September 17 (no. 15636). It was shot late in the evening, as it was following the course of a thicket-bordered ditch stretching across a grain field, a shelter for numerous small birds as well as for rats and mice.

Otus asio kennicotti (Elliot)

Kennicott Screech Owl

At Errington, during September, unmistakable screech owl notes were heard on many occasions, but I was never able to catch sight of one of the birds. They were not heard at any other point visited during the summer.

Bubo virginianus saturatus Ridgway

Dusky Horned Owl

At Beaver Creek, June 9, Despard brought in a horned owl that a neighboring rancher had shot and hung on a fence a week or ten days before. It was a conspicuously dark-colored bird, with heavily marked feet and toes, and was of very large size.

At Errington, during September, they were frequently heard hooting at night, but I never saw one and failed to secure a specimen.

Glaucidium gnoma californicum Sclater

California Pigmy Owl

Observed only in the vicinity of Errington, in September, except as noted beyond. At this point it was heard calling daily, and it is rather remarkable that the call notes were not heard elsewhere. The species is in all probability quite generally distributed over Vancouver Island, and the fact that it was not heard calling until September would seem to indicate that the call note is not given very frequently during the summer months. The notes were heard most often about dusk, but also quite frequently during the day.

Three specimens were secured, two males and a female (nos. 15637–15639). The first, secured on September 11, about 10 A.M., was perched on a pole by some abandoned ranch houses. Its stomach contained a few feathers. The second was taken on September 22. I was clambering over a mass of windfall by the edge of a lake in the woods when the agitation of some chickadees at the other end of the tangle attracted my attention. At first there was nothing to be seen, but finally a pigmy owl flew out and lit on a nearby limb, where it was secured. This was the middle of the day and the bird's stomach contained a large dragon fly, evidently just swallowed, sufficient evidence of diurnal hunting. The third bird was shot after dark, September 23. The collection contains a fourth specimen (no. 15640), killed by Despard near Parksville in September, 1909, and presented by him to the Museum. One was heard calling near Cameron Lake on August 28, and a dried-up wing of a pigmy owl was picked up on the trail at the head of Central Lake.

The four specimens at hand have just finished the annual molt, are consequently in perfectly fresh, unfaded plumage, and present an extremely dark appearance. The general ground color of the dorsal surface is between sepia and bistre, while the streakings of the under parts are still darker, clove brown in two, and more nearly the color of the back in the others. The

only two other adult specimens of *Glaucidium gnoma californicum* at hand, one from Seattle, Washington, the other from Marin County, California, present a decidedly more reddish appearance than these Vancouver Island birds.

Ceryle alcyon caurina Grinnell

Northwestern Belted Kingfisher

A common species on or near the seashore but not so frequently seen farther inland. Some were observed or secured by Miss Alexander and Miss Kellogg at the mouth of French Creek, at Englishman's River, and at Little Qualicum River, in May; and several were seen at Beaver Creek in June. While we were at Nootka Sound they were evidently beginning to migrate south, and kingfishers were of daily occurrence, some along the beach, but more often by the little pond in the woods behind the village.

Ten specimens were preserved, six males and four females (nos. 15641–15650). Through the courtesy of the U. S. National Museum I have been able to compare these with a series of birds from various points in the eastern United States and the West Indies. The seven specimens at hand from Alaskan points (Prince William Sound and the Sitkan district), including the type of *C. a. caurina*, have also been carefully examined in this connection. Following are the measurements of kingfishers from the eastern United States and from the northwest coast region.

	Wing	Tail	Culmen	Bill from nostril	Depth of bill	Bend of carpus to longest secondary in closed wing
Average of six males from Vancouver Id.,	159.3	90.5	58.5	45.6	14.5	132.9
	(157–162.5)	(87–93)	(54–61)	(40.5–48.5)	(13–15)	(132–134)
Average of eight males from eastern U. S. and West Indies,	154.4	84.4	56.8	44.0	12.8	118.8
	(150–159)	(78–89)	(53–59)	(39–47)	(12–13)	(112–127)
Average of five females from Vancouver Id. and Alaska,	161.4	92.8	58.0	44.6	13.6	132.2
	(159–166)	(89–97)	(56–62)	(41.5–48)	(13–14)	(128.5–138)
Average of fifteen females from eastern U. S. and West Indies,	155.4	85.1	56.8	44.5	13.2	116.5
	(152–162)	(78–88)	(51–60)	(40–48)	(12–14)	(105–129)

From these measurements it is apparent that while the birds from northwestern America are a trifle larger than eastern specimens, the differences are very slight. One character of the western birds is quite apparent, however,—the greater length of the secondaries as compared with eastern birds, shown in the closed wing by the diminished space between the tip of the longest secondary and the tip of the longest primary. As shown in the accompanying table, there is almost no overlapping of measurements in this regard in the specimens examined by me. This difference was figured and described by Grinnell (1910, p. 388) in his description of *caurina*, and is constantly present in all the specimens examined by me. It seems to be, however, the only character that can be relied upon in separating the two races, for occasional eastern birds are as large as the largest western ones, and there are no differences in color or pattern.

Dryobates villosus harrisi (Audubon)

Harris Woodpecker

Of fairly common occurrence at every point visited, except at high altitudes. Many were seen at Beaver Creek in June, including full-grown juvenals, which began to appear by the middle of the month. In the higher mountains, the Golden Eagle and King Solomon basins, in July, a few were noted, but they were not common. Seen almost daily at Nootka Sound, both on the Tahsis Canal and at Friendly Cove; and quite abundant in the woods at the head of Central Lake. At Errington, during September, they were common everywhere in the woods.

Compared with a series of hairy woodpeckers from southeastern Alaska the Vancouver Island birds are slightly smaller, and decidedly darker and more smoky on the ventral surface. None of the series shows the light-colored underparts distinguishing the former. In two specimens, no. 15664, Great Central Lake, August 23, and no. 15667, Errington, September 14, both adult males, the white dorsal stripe is very restricted, and streaked with black; in another, no. 15658, Errington, May 24, an adult female, it is distinctly barred. All three, as well as some others in the series, have flank markings, usually black

streaks, but occasionally ill-defined bars. This is an apparent approach toward the characters of *D. v. picoideus* of the Queen Charlotte Islands to the northward.

Wear and fading produces a great change in the color of the under parts, the extent of the difference being well shown in some molting birds. An adult male shot at Central Lake on August 24 (no. 15664) has nearly finished the annual molt, but has a patch of old feathers still remaining in the center of the breast. The color of this patch is about ecru drab; that of the rest of the under parts about no. 4 slate color.

Eighteen specimens were collected (nos. 15651–15668), from various points on the east and west coasts, and from the center of the island.

Dryobates pubescens gairdneri (Audubon)

Gairdner Woodpecker

Apparently of rare occurrence in the region traversed. Two specimens were collected, an adult male secured by Miss Alexander at Parksville, April 26 (no. 15669), and an adult female taken by Miss Kellogg at the same place April 25 (no. 15670).

Noted subsequently on but one occasion, on May 28, when Miss Alexander saw a pair in the woods by the roadside between Parksville and Alberni.

Of the two birds collected the female shows but a few white spots on the wing coverts; the male has numerous spots on the coverts, and all of the remiges are conspicuously spotted on both webs. Both birds have the under parts smoke gray, of about the same tint as the Harris woodpeckers.

Sphyrapicus varius ruber (Gmelin)

Red-breasted Sapsucker

Though looked for carefully at every point visited, this bird was noted on but two occasions, so the species would seem to be of rare occurrence on the island, at least during the summer months. Miss Kellogg found a nest at Beaver Creek, in a huge dead stump in the more open woods. This nest, on June 26, contained two young birds nearly ready to leave, and the carcass of a third, which had been dead several days. Both young and

the female parent were secured (nos. 15671–15673); the male was not seen at any time. The only other occasion on which the species was seen was at Errington, September 26, when one was shot in a cherry tree near our tent. This bird (no. 15674) is an immature female in first winter plumage, with a few juvenal feathers still lingering on the breast.

I searched carefully for the species at Nootka Sound, but failed to find it, though there were old sapsucker workings on trees in the woods. None of this work was at all fresh, and as the perforations are visible for years after they are made, they are of little assistance in determining the abundance of the bird. Old workings were seen at other points on the island also, at Great Central Lake, Golden Eagle Basin, and at Errington.

The Vancouver Island birds, as represented by the four specimens at hand, belong to the northern race of the red-breasted sapsucker, though they are not quite as deeply colored as are Alaskan birds. The color characters of the race are as strongly marked in the two young birds as in the adults. Compared with juvenals of *daggetti* from California the two young ones from Beaver Creek are much darker toned throughout, being decidedly sooty in appearance. One has the back almost uniformly black, there being only one or two tiny flecks of white, nearly hidden in the black feathers.

According to prevailing usage the name *ruber* is applied to the southern race of this sapsucker, but I think that the facts fully warrant its restriction to the northern subspecies. *Picus ruber* of Gmelin (1788, p. 429) was based on Latham's (1782, pp. 562, 563) description of the Red-breasted Woodpecker. I am indebted to Dr. C. W. Richmond for a manuscript copy of this description. It reads as follows:

"Somewhat less than the last. The bill is an inch long, and of a brownish horn-color: the head, neck, and breast, crimson: from each nostril is a line of buff, passing under the eye, where it finishes: the back part of the neck mixed with dusky: back and wings black: several of the lesser wing coverts, near the outside of the wing, are tipped with white, and others of the greater coverts have the outer webs white, making a streak of this color parallel to and near the edge of the wing: most of the scapulars marked with an obscure yellowish spot at the tip: the first quill feather black, marked on the inner web half way from the base

with round spots of white; the others spotted on both webs with white; the secondaries spotted on the inner web only: under wing coverts black and white mixed: the middle of the belly dusky yellowish white: the sides of this last color, mixed with dusky: the tail and legs were wanting.

"This specimen came from *Cayenne*, and is in the collection of *Capt. Davies.*"

That this bird came from Cayenne was, of course, a mistake, but what grounds are there for arbitrarily assuming, as has been done, that it was procured from some point on the coast of California? None that I know of—at least I have seen no published information bearing on the subject—while there is much to be said on the other side.

First, to examine the evidence contained in the description itself, which is remarkably clear as to details. It is not often that descriptions of that date are so lucid as to be capable of application to any one of closely related forms of a species, but it seems to be so in this case. "The bill is an inch long." Of sixty California examples of the red-breasted sapsucker at hand not one has a bill of that size. The average length in the males is about seven-eighths of an inch, or a little less; in the females it is smaller. Alaskan specimens have the bill almost precisely an inch long.

"Most of the scapulars marked with an obscure yellowish spot at the tip." *Daggetti* has the back conspicuously variegated with *white*, sometimes overcast with yellowish, but frequently quite as extensively and clearly white as in *S. varius*. Birds from the northwest coast of California are darker, and those from Oregon and Washington still darker, but it is not until Vancouver Island is reached, and from there northward, that they are found with only obscure yellowish spots on the back. This describes the northern bird exactly.

"The first quill feather black, marked on the inner web half way from the base with round spots of white; the others spotted on both webs with white." On most of the southern birds the first (outermost) primary is definitely white-spotted on the outer web. Sometimes there are only one or two spots near the base of the feather and sometimes it is clearly spotted to the very tip, but in only one or two instances in the extensive series at hand is there a total absence of white spots on the outer web.

The thirteen adult specimens at hand from Alaska and Vancouver Island all have the outer web of the first primary unspotted.

Thus in this description every detail which may be definitely referred to one race or the other points toward the northern form.

Latham's supplementary description (1787, p. 106) includes the tail, and it is on this that Suckow's *Picus ruber notkensis* is based.

All of the early accounts of the species that can be traced at all lead back to Captain Cook's statement of its occurrence at Nootka Sound. In view of Latham's description of the specimen from "Cayenne" being of a tail-less and legless bird, the following excerpts from Cook's (1784, 2, pp. 292, 293) narrative are of interest:

"As the season of the year was unfavorable to our gaining much knowledge of the vegetable productions of this country, so our own situation while there, put it out of our power to learn much about its animals. For as the want of water made it necessary that we should enter the Sound at first, the unforeseen accidents which happened afterwards, though they lengthened our stay, were rather unfavorable to our obtaining any knowledge of this kind. . . . The account, therefore, that we can give of the quadrupeds is taken from the skins which the natives brought to sell; and these were often so mutilated with respect to the distinguishing parts, such as the paws, tails, and heads, that it was impossible even to guess at the animals to whom they belonged; though others were so perfect, or, at least, so well known, that they left no room for doubt about them."

And again (1784, p. 296):

"Birds, in general, are not only rare as to the different species, but very scarce as to numbers; and these few are so shy, that, in all probability, they are continually harassed by the natives; perhaps to eat them as food, certainly to get possession of their feathers, which they use as ornaments. . . . Amongst some other birds, of which the natives either brought fragments, or dried skins, we could distinguish . . . . " etc.

All things considered, it seems to me that the name *ruber* should be applied to the northern race. If the evidence, as given above, is not considered conclusive, then the name should be discarded entirely, for there is absolutely nothing to connect it with the California bird. In any event, *Sphyrapicus varius*

daggetti Grinnell (1901, p. 12) should be the accepted designation of the breeding bird of California.

As to the specific distinction of *S. ruber* and *S. varius*, specimens showing various degrees of intergradation between *ruber* and *S. v. nuchalis* are of common occurrence. Coues (1903, p. 591) accorded *ruber* specific rank on the grounds that, although the males of the two species intergraded, the sexes were alike in *ruber* and different in *varius*, hence there was no intergradation in the females; but occasional females of *S. v. nuchalis* are very slightly, or not at all, distinguished from the males, which would seem to overcome that objection.

Phloeotomus pileatus abieticola (Bangs)

Northern Pileated Woodpecker

Seen at Parksville, Errington, French Creek, Little Qualicum River, Alberni, and Central Lake. At most of these points not more than two or three birds were observed, and the species did not appear to be common at any point visited. None was seen at Nootka, nor anywhere in the higher mountains. Possibly six or seven were encountered in the vicinity of Errington at various times during September. They were usually wary and hard to approach, and as they remained much in the tops of the tallest trees, it was difficult to obtain specimens.

Wherever the birds were seen, sign of their work was also in evidence, particularly on rotten or charred trees, which often had large areas closely covered with punctures made by the woodpecker.

The pileated woodpecker of the northwest coast region has been separated by Bangs (1910, p. 79) as *Phlocotomus pileatus picinus*, type from Sumas, British Columbia, distinguished from *P. p. abieticola* by darker color, and restriction of white markings, especially on the throat. Most of our Vancouver skins are darker than specimens at hand from California, Minnesota, and Illinois, but they vary somewhat among themselves. A male and a female shot at Errington in September, in fresh winter plumage, are appreciably darker and more sooty than those taken in April and May. Some of the Vancouver birds have the throat purely and extensively white; in two it is mixed with a good

deal of dusky. We secured six specimens, four males and two females (nos. 15675–15680). There is not available sufficient material representative of typical *abieticola* to afford a basis for comparison.

Colaptes cafer saturatior Ridgway

Northwestern Flicker.

A common species at nearly every point visited. Miss Alexander reported them as abundant in the vicinity of Parksville in April. At Beaver Creek, in June, they were numerous, and by this time the young birds were out of the nests and scattered through the woods. Very few were observed in the Golden Eagle Basin, but on the summit of Mount Douglas, July 14–16, a number were observed. A few were seen at Nootka Sound, both on the Tahsis Canal and at Friendly Cove. At Errington, in September, the species was abundant, much more so than at any other point.

Thirteen specimens were collected (nos. 15681–15693). All show the dark coloration of *saturatior* to a marked degree, but six of the thirteen exhibit markings similar to those encountered in *C. auratus*. No. 15683 has two yellow rectrices; nos. 15686, 15687 and 15689, all adult males, have more or less distinctly marked red nuchal crescents. No. 15691, juvenal female, has a well-defined nuchal crescent, and no. 15692, juvenal male, besides having such a mark, has a great deal of red on the anterior portion of the crown also. It is interesting that characters of *auratus* should appear so often in specimens of *cafer* secured in a region far distant from the point of junction of the two species.

Chordeiles virginianus virginianus (Gmelin)

Nighthawk

Seen in the vicinity of Alberni at different times from June 14 to August 27, and at Errington in September, but nowhere else. Though the birds were observed every time I visited the town of Alberni, they were not seen at all at our camp on Beaver Creek, fifteen miles north of town. On one occasion one was heard calling at a point some three miles south of camp. None was seen in the mountains south of Alberni, nor at the head of

Central Lake, some thirty-five miles from the town, though the surface of the lake might be supposed to form an attractive feeding ground. Not met with at Nootka.

Although not common at Errington, some were observed nearly every evening during the first half of September. They appeared about dusk, hawking over the grain fields, and in diminishing numbers until September 15, when the last was seen. Though generally observed sailing about in the usual manner of the species, several were seen to alight on the ground, and from there to make occasional flights after passing insects, much in the manner of the poor-will. One of them when secured proved to be an immature bird, so it may be that the young nighthawks feed in this manner until their wings become strong enough to support them in more prolonged flights.

Four specimens were secured (nos. 15694–15697), two males and two females, an adult and an immature of each. The two adults, taken at Errington, August 29 and 30, are in worn breeding plumage, the male just beginning to molt, as shown by a few pin feathers on the forehead. The immature male differs from the adult principally in lacking the subterminal white tail band, and in having the white throat patch much obscured by black or brownish markings. The immature female differs from the other three birds in being much more ochraceous on all parts.

The adults are markedly different from any nighthawks available from more southern localities in the west. *C. v. hesperis* as illustrated by specimens from California, Oregon, and Nevada, is more grayish, while *C. v. henryi* from southern Arizona is decidedly more brown in general tone of coloration. The Vancouver birds are very dark colored, and are not to be distinguished from examples of *C. virginianus virginianus* at hand from Illinois and Wisconsin.

In defining the ranges of the western varieties of the nighthawk, our latest authority, the A. O. U. *Check List of North American Birds*, 1910 edition, states that *C. v. hesperis* occurs in southwestern, and *C. v. henryi* in southeastern British Columbia. If that is the case, *C. v. virginianus* has an interrupted range disappearing on the mainland of southwestern Canada to reappear on Vancouver Island. As it is stated to occur in southern

Yukon, it may, however, range from that point southward through British Columbia, nearly to the southern boundary of the province, where it is replaced by the other two forms, as stated. In all probability the migration route of the Vancouver Island nighthawk lies to the eastward of the coast ranges, as is the case with other species of somewhat similar distribution.

Cypseloides niger borealis (Kennerly)

Black Swift

Observed at most of the points visited. A single bird seen at Alberni on June 9, and a large flock at Beaver Creek on June 10. At Alberni, August 12 to 16, they appeared in numbers every evening together with the nighthawks. Large flocks were observed at Nanaimo, on June 17 and 30, circling about over some fields at the outskirts of the town. A few seen at Nootka Sound, on the Tahsis Canal, July 28, and at Friendly Cove, August 6. At Errington, in September, they were common, appearing at dusk with the nighthawks and circling about until after dark. They diminished in numbers before the middle of the month, and the last was seen September 20.

The presence of these birds, feeding in flocks in the lowlands of the region throughout the summer, would lead to the inference that they were breeding at higher altitudes nearby, but none was observed anywhere in the mountains. They were not seen otherwise than in flocks, nor did their actions at any time suggest the probability of their breeding in the immediate vicinity of the place where they were encountered. Usually they were circling about overhead, far beyond gunshot. One specimen was secured, an adult female (no. 15698), taken at Errington, August 30.

Chaetura vauxi (Townsend)

Vaux Swift

Fairly common at Beaver Creek in June, flocks being frequently observed feeding over marshy meadows in the vicinity. Not met with again until we reached Errington, in September. At this point small flocks were seen on various occasions early in the month, but all had disappeared before September 15.

Selasphorus rufus (Gmelin)

Rufous Hummingbird

An abundant summer resident on Vancouver Island. Numerous in the vicinity of Parksville and Little Qualicum River in April and May, as reported by Miss Alexander and Miss Kellogg. At this time they were noted as frequenting thickets of gooseberry bushes. At Beaver Creek, in June, they were abundant everywhere. Many were seen in the Golden Eagle Basin, July 1 to 19, but mostly immature birds, only one or two adult males being observed.

This was one of the species of birds of which we were anxious to obtain a good series of specimens from Nootka Sound, but at the time of our visit there the adult males had already departed, and the females and immatures were becoming decidedly scarce. Mr. Smith told us that earlier in the summer they were quite abundant, and frequently to be seen hovering over the flowers in his garden.

The last hummingbird observed during the summer was one seen at the head of Great Central Lake on August 22. Thirty specimens were collected (nos. 15699–15728), nineteen adult males, five adult females, and six immatures. Seven specimens were taken at Nootka Sound.

Nuttallornis borealis (Swainson)

Olive-sided Flycatcher

Seen and heard daily in the vicinity of our camp at Beaver Creek in June. They were not really abundant, but were scattered throughout the valley, individuals frequenting the same localities, frequently the same favorite perch, day after day, and though no nests were found they were undoubtedly breeding in the vicinity. The only other place where the species was observed was at the head of the Tahsis Canal, a single bird, apparently migrating, being seen on July 26.

Our failure to find the species at the other points visited on the island is rather strange, environmental conditions at these places being so very similar, and the bird being sufficiently conspicuous as not to be readily overlooked if present.

Three specimens were collected (nos. 15729–15731), a male and two females, all adults.

Myiochanes richardsoni richardsoni (Swainson)

Western Wood Pewee.

Though fairly common at Beaver Creek and in the vicinity of Alberni during the time we spent at these points, it was seen nowhere else. Usually observed at the edge of clearings and meadows, and in more open places in the woods. The two specimens preserved (nos. 15732, 15733), adult male and female, are in no wise to be distinguished from others taken at more southern points.

Empidonax difficilis difficilis Baird

Western Flycatcher

The range of the western flycatcher on Vancouver Island, as observed by us, presents certain points of interest, compared with its manner of occurrence farther south. In California *difficilis* is found in summer in high Upper Sonoran Zone and the lower part of Transition, a lower faunal area than that occupied by the *wrighti-griseus-hammondi* group of flycatchers. On Vancouver Island these conditions appear to be reversed. In midsummer *difficilis* was absent from the lowlands, where *hammondi* was breeding in some numbers, while we found it in the only high mountain locality we visited during the nesting season —a place where *hammondi* was not observed.

Specimens of *E. difficilis*, evidently migrants, were taken at the Little Qualicum River and at French Creek, at various times from May 8 to 18. At Beaver Creek, in June, I looked for it carefully, but without success, and the call-note of the bird is sufficiently loud and distinct to render it probable that it would have been noticed. At the Golden Eagle Basin, altitude 2200 feet, and on the surrounding mountains, it was quite common in July. It was a hard matter to get sight of the birds in the dense woods in that locality, but they could be heard calling incessantly.

A few seen at the head of the Tahsis Canal during the last week in July were probably individuals that had already begun to move from their breeding grounds, as were several others secured along the beach at Friendly Cove, the first week in August.

None was seen at any point visited subsequent to our departure from Nootka Sound on August 11.

Ten specimens were secured (nos. 15734–15743), taken at the Little Qualicum River, French Creek, and Friendly Cove.

Empidonax trailli trailli (Audubon)

Traill Flycatcher

Breeding in numbers in the bottom lands at Beaver Creek. The numerous willow thickets in this locality constitute a suitable summer home for the species, and the call note was frequently heard, though the dense vegetation rendered it difficult to catch sight of the birds. About the town of Alberni, also, Traill flycatchers were noted on many occasions.

At the head of the Tahsis Canal, July 24 to August 1, several were met with, easily recognizable as they were calling continuously, but here again I was prevented from securing specimens on account of the impenetrable nature of the vegetation they frequented. These appeared to be migrants, and as none was observed at any point subsequently visited, they probably depart from the region rather early in the fall.

Five specimens were collected (nos. 15744–15748), four males and one female, all taken at Beaver Creek on dates ranging from May 31 to June 25. They are indistinguishable from comparable specimens from California.

Empidonax hammondi (Xantus)

Hammond Flycatcher

An abundant species at many of the points visited. Many migrating birds taken in the vicinity of Parksville and French Creek in April and May, the earliest arrival noted being on April 29.

At Beaver Creek they were breeding in some numbers, at a slightly higher altitude than our camp. At this point the valley becomes more narrow, steep, and broken, rising up into higher hills beyond, and this change in the character of the country is accompanied by certain changes in the bird population. Our camp was about at the dividing line between the ranges of *E. hammondi* and *E. trailli*, and the abruptness with which one

species was replaced by the other was strikingly apparent in a walk along the trail.

The Hammond flycatchers remained almost altogether high up in the fir trees, where they could be heard calling continuously, but they were very difficult to see. In all respects their actions, habits, and manner of occurrence were exactly like those of *E. griseus* as observed in the mountains of southern California, and many of the call-notes also seemed to me to be exactly the same. They appeared to be quite regularly distributed throughout the region where they were observed, and, in a walk along the trail, pairs of the birds would be encountered at intervals of about three hundred yards. A female secured on June 20 (no. 15759) was evidently sitting on a full complement of eggs, judging from her denuded abdomen, but I failed to find the nest.

There were a few in the woods at the head of the Tahsis Canal, Nootka Sound, and an adult and two juvenals secured are sufficient indication of their breeding at this point. As an old bird was observed feeding the young ones secured, they were probably not long out of the nest. A few were observed at the head of Central Lake, but none secured.

I saw none at Errington when we arrived there, August 29, but they appeared a few days later; one was shot on September 3, and shortly after they became fairly common. The last was taken on September 20.

The three species of *Empidonax* encountered on Vancouver Island appear to occupy distinct areas during the breeding season. *Trailli* occurs in the lowlands of the southern part of the island, *difficilis* at high elevations—possibly of general distribution in the north—while *hammondi* occupies an intermediate zone. Our observations were not sufficient to demonstrate conclusively that this is the case, but the evidence certainly points in that direction. The sharply defined ranges of *hammondi* and *trailli* as observed at Beaver Creek, the replacement of both these species by *difficilis* at the higher elevations visited, and the occurrence of *hammondi* apparently as a migrant only in the lowlands around Errington, are all corroborative of such a view.

Twenty-nine specimens of Hammond flycatchers were secured (nos. 15749–15777): eighteen adults from Parksville, French

Creek, Errington, Beaver Creek, and Nootka; four juvenals, two from Nootka Sound, and two from Errington, September 3, 4 (these latter apparently migrating); six immatures, in fresh fall plumage, taken at Errington in September, and one adult female in fresh fall plumage, shot at Errington, September 4.

Cyanocitta stelleri stelleri (Gmelin)

Steller Jay

A common species at most of the points visited. Found in greatest abundance about Parksville and Errington, and also at Alberni and Beaver Creek, being probably the commonest species of bird at the latter point. Very few were seen in the high mountains. At our camp in the Golden Eagle Basin a family of Steller jays hung about the camp daily, entering the cabins and stealing odds and ends of food, but only one or two were seen elsewhere in the vicinity.

We were particularly anxious to obtain a good series of jays from Nootka Sound, the type locality of the species, but found them unexpectedly rare, as I was told was the case along the whole west coast of the island. At our camp at the head of the Tahsis Canal in one week's time I secured one bird, and heard another calling in the distance. At Friendly Cove I was rather more successful, collecting eight specimens, but this was only through a special effort, following up every bird heard calling, and letting pass no opportunity of getting one. Not more than two or three were seen or heard in addition to the eight secured.

At Errington, in September, the jays were exceedingly abundant, particularly about the edges of the pastures and grain fields. Harvesting operations were in progress at this time, and a wheat field near our camp had just been cut and the grain piled in shocks. On those nearest the edges of the field, close to the shelter of the woods, the jays were feeding by scores; when startled most of the birds departed, carrying one or more long straws with them, to be thrashed out at their leisure in the nearby woods. Certain favorite stumps and logs were well covered with straws from which the grain had been eaten.

It seems probable that the partial settlement and cultivation of the country is favorable to the increase of the species, not so

much by diminishing the number of predaceous birds and mammals, for I doubt if these affect the jay population appreciably, but through the supplying of an abundance of food and more congenial surroundings. They certainly prefer partly cleared or fairly open woodland to the dark, uninterrupted forest, and this is, I believe, the main reason for their much greater abundance about the outskirts of civilization on Vancouver Island than on the densely forested west coast. At the latter point they were present in about the same numbers as on the coast of southeastern Alaska, where conditions are very similar.

Forty-nine specimens of Steller jays were collected during the summer (nos. 15778–15826), twenty-three summer adults, eighteen juvenals, and five adults and three immatures in fresh fall plumage. Most of the young were taken at Beaver Creek during June; none at any of the earlier camps. The Nootka series (nos. 15813–15821) consists of three adults and six young. The young birds (taken from July 28 to August 10) are all well advanced in the post-juvenal molt. The three adults (two shot on August 8, and one on August 10) are in fresh winter plumage. This seems to me to be a very early date at which to have completed the post-nuptial molt, but only one of the three has any pin feathers remaining, and this one but a few. The large flocks seen at Errington in September were all in perfect winter plumage.

I have compared the large series of Steller jays we collected on Vancouver Island with the Alaskan material in the Museum with much interest, especially so with the birds from the more southern Alaskan islands (Prince of Wales, Dall, etc.). I still (see Swarth, 1911, p. 78) do not see that we are justified in considering the Prince of Wales birds the same as *carlottae*. They are slightly larger than the average of typical *stelleri* (though well within the range of variation of the subspecies), and some individuals are, perhaps, a slightly deeper blue, but the differences are too slight and impalpable to warrant our considering these individuals as *carlottae* (see Osgood, 1905, p. 70) and thus extending the range of this subspecies over *part* of an island (widely separated from the rest of its habitat), when there is nothing to hinder its occurrence over the rest of this and on adjacent islands.

Winter-plumaged examples of *stelleri* from Vancouver Island, especially the three adults from Nootka Sound, are quite as dark colored as the darkest of the birds from the southern Alaskan islands.

Measurements of Series of *Cyanocitta stelleri* from Various Points on the Northwest Coast

	No.	Wing	Tail	Culmen	Tarsus
Three adult males from Nootka Sound,	15818	150.0	141	30	42
	15819	150.5	137	30	41
	15820	148.0	138	31	45
Average of seven males from various points on Vancouver Island,		148.6	140.1	30.5	42.6
Average of four males of *C. s. carlottae* from Queen Charlotte Islands (Ridgway, 1904, p. 354),		156.2	.....	30.4	48.0
Average of four males from Prince of Wales and Dall islands, Alaska,		152.9	142.2	31.1	46.5
Average of six males from Baranof and Admiralty islands, Alaska,		148.7	137.5	30.7	43.5
Average of five males from Prince William Sound, Alaska,		148.2	136.2	30.3	41.1

Perisoreus obscurus obscurus Ridgway

Oregon Jay

In the summer, at least, a resident at high altitudes only, and of rather uncommon occurrence. We first met with the species in the mountains south of Alberni. On July 3 Despard saw several on the trail below King Solomon's Basin, and again, July 9, on Mount Douglas. On July 15 we were together on Mount Douglas, when he killed a bear. While we were engaged in skinning the animal, entirely hidden by the surrounding trees and underbrush, a flock of Oregon jays suddenly appeared, to feed on the refuse. There were five in all, a pair of adults and three young ones, evidently a family gathering. The species was not again met with until August 18, when several were seen flitting through the shrubbery at the edge of Great Central Lake. A few days later, August 21, three were secured on the mountain slope above Della Lake, at an altitude of about 4000 feet. On September 8 a flock of four or five individuals was seen in a dark cañon on the north side of Mount Arrowsmith.

On the few occasions we had to observe them, the Oregon jays

showed the absolute indifference to human presence that is so characteristic of the genus. They were not seen until almost within arm's reach, dropping silently about us from the trees like huge, feathery snowflakes. They had, however, a disconcerting way of keeping on about their own business and were not to be distracted by appeals to their curiosity, such as are so successful with *Cyanocitta* and *Aphelocoma*. Thus the flocks observed at Great Central Lake and below Mount Arrowsmith were evidently traveling somewhere, and though they suddenly appeared within a few yards of where we were sitting, they disappeared, fading away, before we realized it, and were not to be recalled by any amount of "squeaking," such as would bring the Steller jay back, headlong, to investigate.

Eight specimens were preserved (nos. 15827–15834), two adults and three juvenals from Mount Douglas, July 15, and two adults and one juvenal from Della Lake, August 21. The adults were all undergoing molt, showing patches of old and new plumage. The three young birds from Mount Douglas are in the juvenal plumage purely; the one from Della Lake is in the midst of the post-juvenal molt.

Compared with a large series from Humboldt Bay, California, the Vancouver Island birds are decidedly larger, with especially larger bills, being nearly the size of *P. o. griseus*, of the interior. The type locality of *P. o. obscurus* is Shoalwater Bay, Washington, almost exactly midway between the points where these two series of jays were collected. The measurements of typical *obscurus*, as given by Ridgway (1904, p. 372) are intermediate between those of the two series at hand, and it is probable that the Vancouver Island birds and the Humboldt Bay birds, taken at the extreme north and south points of the known range of the species, represent the extremes in size. I cannot detect any color differences between the specimens from the two regions.

Measurements of the Vancouver Island Adults

No.	Sex	Wing	Tail	Culmen	Tarsus
15830	♂	140	132	22	34
15832	♂	140	131	21	35
15831	♀	138	136	20	33
15833	♀	142	135	....	34

Average of Four Adult Males from Humboldt Bay, California

Wing	Tail	Culmen	Tarsus
133.75	123.37	18.25	30.87

Average of Four Adult Females from Humboldt Bay, California

132.25	124.0	18.25	31.12

Corvus corax principalis Ridgway

Northern Raven

Nootka Sound was the only place where ravens were seen in any numbers. Here, both at Friendly Cove and on the Tahsis Canal, they were very abundant, feeding in flocks on the mud flats and along the beaches. Two specimens were secured on August 1, juvenals, molting into the first winter plumage (nos. 15835, 15836).

At Beaver Creek a few were seen at different times during June, probably not more than five or six altogether. They were not observed elsewhere.

Corvus brachyrhynchos caurinus Baird

Northwestern Crow

Common everywhere near salt water but not observed at any point very far inland. Miss Alexander saw them at Parksville, April 25, and I met with them in numbers at Nanaimo, on June 8. At Nootka Sound there were numerous good-sized flocks feeding on the mud flats at low tide, frequently in company with the ravens.

The only inland point where crows were met with was at our camp near Errington, about five miles from the coast. Early in the morning of September 26 large flocks, numbering probably several hundred individuals, suddenly appeared and settled on the trees in the vicinity. After a stay of several hours they departed, but as they flew directly northward this can hardly be considered as indicative of any regular migratory movement.

Agelaius phoeniceus caurinus Ridgway

Northwestern Redwing

Miss Kellogg shot five red-winged blackbirds, three males and two females (nos. 15837–15841) on the Little Qualicum River.

May 9 and 10. They were evidently breeding, the ovaries of the females containing well-developed eggs, but the five birds secured apparently formed the entire colony as they were all that were seen. The species was not encountered at any other point.

The specimens secured have the extremely slender, sharp-pointed bill characteristic of the race *caurinus*, and appear to be typical examples of that form.

Sturnella neglecta Audubon

Western Meadowlark

A fairly common species in the more settled portions of the southeastern part of the island, and to a lesser degree as far west as Alberni. Seen in the fields about Parksville on numerous occasions in May and June.

In the Beaver Creek Valley, extending some fifteen miles north of Alberni, there are scattered tracts of cleared land, some under cultivation, others formerly cultivated but now abandoned. Meadowlarks occur in small numbers to the limit of these open places. Most of these tracts were cleared but a few years ago, and I was told that the birds appeared after the land was deforested. In all probability this is what has happened over the entire range of the meadowlark on Vancouver Island. Before the settlement of the region by white men, there could have been but very small areas sufficiently free from forests to support the species, whereas the clearing of the land for farming purposes has undoubtedly enabled it to establish itself on the island, and to extend its range yearly.

At Errington, in September, a flock of thirty or forty frequented some grain fields in the vicinity of our camp, where they were seen daily. They were exceedingly wary and unapproachable and I had difficulty in obtaining specimens.

In all, eleven meadowlarks were secured (nos. 15842–15852), five in April and May, and six in September in fresh fall plumage. They are quite indistinguishable from comparable specimens from various parts of California, environmental differences apparently having been so far unable to produce any appreciable modifications of color or markings. These birds, in a region whose climate is supposedly productive of the dark

style of coloration seen in many of the forms occurring therein, are not to be distinguished from others of the species residing in the most arid parts of North America. The transplanting of this species to altered surroundings has not been immediately followed by the appearance of those adaptations supposedly most advantageous to the inhabitants of the region. In other words, the coloration of this bird appears to be an inherent, deep-seated character, and one that surrounding conditions have not directly affected.

Euphagus cyanocephalus (Wagler)

Brewer Blackbird

A common species on the east side of Vancouver Island, especially in the vicinity of settlements and clearings. A very few were seen near Alberni, but on the west coast they appeared to be entirely absent, for none was observed. A breeding colony was discovered in a swamp near Errington on May 20; the several nests examined at this date all contained young. One nest was placed in a bunch of grass at the edge of a ditch, and others were up in the bushes.

I revisited this place in September, and saw flocks of blackbirds almost daily. They were then feeding in nearby grain fields which had just been harvested.

At Beaver Creek, in June, there were a few scattered pairs breeding in pasture land in the vicinity, but no colonies. From the solicitude shown by the old birds when we appeared in their vicinity it was evident that they had young somewhere near, but we did not discover any nest.

Fifteen specimens of Brewer blackbirds were collected (nos. 15853–15867), four adult males, six adult females, four juvenals, and one immature female in first winter plumage.

Pinicola enucleator flammula Homeyer

Kadiak Pine Grosbeak

Seen at only one point, on the ridge leading up to Mount Douglas, at an altitude of about 4200 feet. Early in the morning of July 15 I heard one singing in a tree top near camp, but he ceased before his exact whereabouts could be ascertained. Later in the day a single bird was seen sitting on the top of a scrubby

little fir tree, such as are scattered all along the ridge, and, with a little trouble, was secured. An hour or two later another was observed in a similar location, but was too wary to be approached. They did not appear to be feeding, but sat quietly on the tree tops, giving utterance to an occasional low whistle. These three were all that were observed.

The specimen secured (no. 15868) is a male in juvenal plumage, just beginning to molt into first winter plumage. It is rather a dark colored bird, compared with the juvenals of *P. c. californica* at hand, but the distinguishing feature of the specimen is the large, swollen bill. In this, as well as in other respects, it is indistinguishable from comparable examples of *P. e. flammula* from the coast of Alaska, to which race it is apparently to be referred.

While the capture of this young bird does not in itself constitute a breeding record, it makes it seem highly probable that the species does breed in some parts of the island. This is far south of the breeding range of *flammula* as defined heretofore, but a pine grosbeak breeding on Vancouver Island would, reasoning from analogy, be more apt to be related to the bird of the Sitkan district of Alaska, directly to the northward, than to the one residing in the interior of British Columbia.

Carpodacus purpureus californicus Baird

California Purple Finch

A fairly common species on the east side of Vancouver Island, but not seen on the west coast. The second week in May, on the Little Qualicum River, male birds were observed, singly, sitting in the tree tops singing. Two females collected at this time by Miss Alexander contained eggs in their oviducts. At Errington, in September, small flocks and single birds were seen from time to time throughout the month, usually feeding in clumps of willows.

Fifteen specimens were collected (nos. 15869–15883). Eight are adult males, two are breeding males, but in the brown, streaked plumage, four adult females, and one an immature female in first winter plumage. In both sexes the colors are appreciably darker than in most California examples of the

species; the red in the adult males more intense, the ground color of the females more olivaceous. Occasional California specimens, however, are not to be distinguished from the Vancouver birds.

Loxia curvirostra minor (Brehm)

Crossbill

Common at many of the points visited. Miss Alexander and Miss Kellogg collected a number of specimens at Parksville and Errington, in April and May, when they were gathered in large flocks. A few were seen at Beaver Creek from time to time in June, but they were not abundant. At the Golden Eagle Basin, in July, they were quite numerous, gathered in flocks of old and young together, but usually feeding in the tree tops, where they received the benefit of the sunshine, and seldom descending to the ground below where the sun's rays rarely penetrated. None was seen either at Nootka Sound or at Great Central Lake, but this was probably fortuitous, as the species is in all probability of general distribution over the island. A few were noted at Errington, during September, but not in any numbers.

Although at the Golden Eagle Basin they were feeding almost exclusively in the tree tops, at other points they frequented the ground. Near Parksville they were frequently observed on the beach, sometimes in the sand or gravel, or in the beach grass, and sometimes feeding in the drifted kelp. At Errington some were shot with their mouths filled with mud and sand, and at Beaver Creek a small pile of gravel under the shelter of a barn on an abandoned ranch, was an attraction that was visited daily by crossbills.

If *Loxia curvirostra sitkensis* Grinnell (1909, p. 223) turns out to be a recognizable form it will probably prove to be restricted to southern Alaska, for I do not see how the Vancouver Island crossbill can with certainty be distinguished from birds from eastern North America.

The expedition collected ninety-two specimens (nos. 15884–15975), of which fifty-seven are adult males, twenty-two adult females, and thirteen juvenals. Of the old males about one-half are rather brilliantly red, quite as much so as those from eastern points. The others are variously greenish-yellow, orange, or

parti-colored, some of them quite similar to some of the Alaskan birds on which the description of *sitkensis* was based. Possibly further collecting will produce Alaskan crossbills in the bright red plumage, but however that may be, no color difference can be maintained to exist between Vancouver Island and eastern birds, nor do I find that there are any notable differences in the measurements of specimens from the various regions.

The duller colored, presumably younger, males, show considerable variation. Some are quite uniformly dull red or orange, while others have the body plumage of about the greenish yellow color of the female, but interspersed with patches of quite brilliant red. It accordingly seems possible that the brightest plumage may be acquired through a single change, rather than after a series of molts into successively brighter red plumages.

One bird with many red feathers in the greenish yellow body plumage, still retains on the abdomen the streaked feathers of the juvenal plumage. Two adult females also have similar tracts of juvenal feathers still lingering. Several males shot during April and May, and early in June, are undergoing a slight molt about the head and neck. One bird with comparatively few yellow feathers in the red plumage, is nevertheless acquiring additional yellow ones by this change.

Streaked young were taken in April, May, June and July. One shot at Parksville, May 4, is already changing into first winter plumage.

Measurements of *Loxia curvirostra minor* from Vancouver Island

	Wing	Tail	Culmen	Depth of bill	Tarsus
Average of ten adult males,	86.36 (83.8–90.0)	49.38 (46.0–51.8)	15.75 (15.0–17.0)	9.05 (8.5–9.8)	15.39 (14.0–16.0)
Average of ten adult females,	82.49 (79.0–85.2)	46.65 (44.5–50.5)	14.77 (14.0–16.8)	8.5 (8.0–9.0)	15.53 (14.2–16.8)

Spinus pinus (Wilson)

Pine Siskin

Fairly common, and observed at nearly every collecting station except at Nootka Sound. Specimens were collected at several points on the east coast—Parksville, Errington, and Little

Qualicum River. Two stubby-tailed juvenals collected at Errington on May 25 were evidently not long out of the nest, and had undoubtedly been hatched in the immediate vicinity. Toward the west side of the island they became less common, but in the Golden Eagle Basin (altitude 2200 feet) it was one of the few species of birds that were fairly abundant.

A solitary siskin seen feeding on a snowbank (probably on seeds blown from adjacent shrubbery), on the mountain side above Della Lake (about 4000 feet), August 20, was noteworthy as being one of just three species of birds seen during a half day's hunt, the other two being the white-tailed ptarmigan and buffle-head duck.

Nine specimens were preserved (nos. 15976–15984), five adults and four juvenals.

Calcarius lapponicus alascensis Ridgway

Alaska Longspur

Seen only at Errington. First observed on September 15, and thereafter, in small companies of six or eight, on various occasions up to the end of the month. They frequented the stubble fields in the vicinity, and were rather shy and difficult to approach, so much so that I failed to secure any specimens.

Passerculus sandwichensis savanna (Wilson)

Savannah Sparrow

Abundant as a migrant, but observed nowhere under circumstances that led us to believe they were breeding. Numerous in the spring in the fields about Parksville, Little Qualicum River, and French Creek, evidently migrating; and specimens were taken at various times up to May 19. None seen in midsummer at any point.

There were none at Errington upon our arrival there August 28, but on September 6–8, when we ascended Mount Arrowsmith, we found them in numbers on the heather-covered slopes near the summit. There was a heavy storm at this time, September 7–9, and immediately thereafter the Savannah sparrows began to appear in the fields about Errington. By the end of the month

they were exceedingly abundant. Thirty specimens were preserved (nos. 15985–16014), twenty-two being spring adults, and six immatures and two adults in fresh winter plumage. They are precisely like birds from the coast of southeastern Alaska; in all probability most of them are migrants from that region. As already pointed out by Grinnell (1909, p. 227) and myself (1911a, p. 85), the Savannah sparrow of the northwest coast is practically indistinguishable from *P. s. savanna* of eastern North America, and I continue to use this name for the form. The additional material obtained does not furnish obvious means of distinguishing the races, and I am unable to do so; from *P. s. alaudinus* these coast birds are widely different, and should not be lumped under the same name.

Zonotrichia leucophrys gambeli (Nuttall)

Intermediate Sparrow

Seen at Errington in September, evidently migrating. The first was taken on September 17, and for a short time thereafter a few could usually be found in thickets and brush piles about the edges of the cleared fields. Nearly all had disappeared before the end of the month. Two specimens were preserved (nos. 16015, 16016), an adult female and an immature male.

Zonotrichia leucophrys nuttalli Ridgway

Nuttall Sparrow

A common species on the east coast of Vancouver Island, but observed nowhere on the west side. In driving between Nanaimo and Alberni, as I had occasion to do several times during the summer, the Nuttall sparrows were conspicuous along the roadside to a point a little beyond Parksville, some thirty miles north of Nanaimo, but soon after the road turned to the westward they ceased to be seen.

Though no nests were found the species was undoubtedly breeding in this region. A female collected by Miss Alexander at French Creek, on May 13 (no. 16024), is entered in her notebook as containing eggs in its oviduct. None were seen during June, July and August, spent on the west side of the island, and

when we returned to the east coast, in September, they apparently had migrated, an immature male, shot at Errington, September 9 (no. 16027) being the only one noted. A day or two later a few white-crowned sparrows began to appear in the thickets but all that were shot proved to be *gambeli*, evidently just arriving from the north. This would indicate that *nuttalli* was a summer resident only, in the region.

Eleven specimens were preserved (nos. 16017–16027), ten in summer plumage and one immature male in first winter plumage.

Zonotrichia coronata (Pallas)

Golden-crowned Sparrow

Evidently a common migrant on Vancouver Island. Seen in the vicinity of Parksville in April and May, and at Errington in September. Six specimens taken by Miss Alexander and Miss Kellogg at Parksville and the Little Qualicum River (nos. 16028–16033), the last on May 10, were all females, possibly an indication that the males had already passed through.

Common at Errington the latter part of September. First seen on September 13 and thereafter observed daily in the thickets and brush piles. Two immature females in first winter plumage secured (nos. 16034, 16035). They were still abundant when I left, at the end of September, though the white-crowned sparrows had nearly all gone.

Spizella passerina arizonae Coues

Western Chipping Sparrow

Four adults taken at Parksville in April and May (nos. 16036–16039), where the species was probably breeding. It was not seen anywhere on the west side of the island, though there was no obvious reason why it should not occur about Alberni, environmental conditions being very much as they were on the east coast, and apparently quite as favorable.

Subsequently met with only at Errington, where, on September 18, a number suddenly appeared, apparently migrating, and one in juvenal plumage was secured (no. 16040). They disappeared as quickly as they came, and were not seen again.

The five specimens secured, both adult and juvenal, are not

to be distinguished, either by coloration or size, from comparable specimens from California.

Junco oreganus oreganus (Townsend)

Oregon Junco

Juncos were found in abundance at every point visited, except Nootka Sound, where none was seen. That they occur here, too, however, is evident from the description given by Captain Cook (1784, p. 297) of a finch seen at this point in April, 1778. Full-grown juvenals were taken at Errington the last week in May; and at Beaver Creek in June, they were in evidence everywhere. Juncos were fairly common in the Golden Eagle Basin in July, frequenting the willow thickets and underbrush in the comparatively open "Basin," though but seldom seen in the dense woods of the cañons below. A number were seen on Mount Douglas (4200 feet), July 14, and a nest was found containing four eggs. It was just off the ground, in a mass of heather, and completely hidden in the vegetation.

Juncos were abundant at Errington throughout September, gathered in large flocks, composed principally of young birds, which by this time had assumed the first winter plumage.

The breeding junco of Vancouver Island has been referred to *J. o. shufeldti* (see Ridgway, 1901, p. 285), but I cannot with certainty distinguish our series (sixty-one specimens—nos. 16041–16101) from breeding birds of *J. oreganus oreganus* taken in southern Alaska. Selected Alaskan specimens have the brown and vinaceous areas somewhat more richly colored than any of the Vancouver Island birds, and certain of the latter have those areas less rufescent than any of the Alaska birds, but many specimens in the two series are quite indistinguishable. Furthermore, September birds from Alaska and from Vancouver Island, in fresh fall plumage, unworn and unfaded, are precisely alike. It may be argued that birds taken on Vancouver Island in September might have migrated from points farther north, but there is an adult male in the series (no. 16091, Great Central Lake, August 24, 1910), in the midst of the molt, and obviously not a migrant, which is acquiring a plumage as dark as fall examples of *oreganus* from Alaska.

Winter specimens of *shufeldti* from southern Arizona, aside from the color differenees distinguishing them from the series under discussion, are appreciably larger, or at least have considerably longer wings. There is no size difference between the Alaska and Vancouver Island birds.

It seems more reasonable to regard as *shufeldti* (a pale colored bird with a long wing) the form inhabiting the more arid interior of British Columbia, forced by the severe winter climate to migrate far southward; and as *oreganus* the breeding bird of the humid coast region, south to include Vancouver Island.

This is the course adopted by Mr. Frank M. Chapman in his treatment of the juncos contained in the collection of British Columbia birds reported upon by him (1890, pp. 145–146); and it is certainly to be expected that the junco of this coast region should be more nearly like the southern Alaska race, climatic and environmental conditions being so nearly similar, than that it should resemble the bird from the widely different interior of British Columbia.

Melospiza melodia rufina (Bonaparte)

Rusty Song Sparrow

Abundant everywhere except in the high mountains. The numerous water courses, lakes and swamps, with the profusion of sheltering underbrush, both characteristic of Vancouver Island, provide ideal surroundings for song sparrows, and we found them in numbers at almost every point visited. At Parksville, the last week in April and early in May, females were taken which contained eggs nearly ready to be laid, and at the Little Qualicum River, a nest built in a rose-bush was found on May 11, with three small young. Another nest with young, possibly a second brood, was found at Beaver Creek a month later, June 12. Young birds taken at Nootka Sound during the last week in July are just beginning the post-juvenal molt; those taken at Errington, in September, are, with the exception of one or two shot early in the month and still showing traces of the juvenal plumage, in complete first winter plumage.

Adults taken at Nootka between July 24 and August 11 are mostly in the midst of the annual molt. One or two, in exceed-

ingly worn plumage, have hardly begun to change, and one, shot on July 28, is nearly through.

At every point visited on the east coast, song sparrows were found in numbers in suitable places. At Beaver Creek and around Alberni they were also very abundant. In the Golden Eagle and King Solomon basins, in July, I saw quite a number, mostly full-grown young, but I am inclined to believe that these birds were wanderers from the lowlands, and that they were not hatched at that altitude.

At Nootka Sound, both on the Tahsis Canal and at Friendly Cove, they were very abundant, one of the few species that was really common at these points. None was seen at the head of Central Lake, nor in the high mountains beyond. At Errington, in September, they were present throughout the month.

Song sparrows were collected in some numbers at every point where they were encountered, the resultant series amounting to 148 specimens (nos. 16102–16245, 16683–16686). Of these, ninety-seven are summer adults, thirty-eight juvenals (four in alcohol), and nine immatures and adults in fresh winter plumage. The post-nuptial and post-juvenal molts are fully illustrated. After careful comparison of these birds with a series of forty specimens of the breeding form of song sparrow of southeastern Alaska, I am quite unable to perceive the differences supposedly distinguishing *morphna* from *rufina* (see Ridgway, 1901, p. 373), and have consequently referred the Vancouver Island birds to the latter form.

Certain individuals in the Alaskan series show a decided tendency toward the characters of *caurina*, and are thus quite different from any of the Vancouver Island specimens, but taking the majority of the skins from the two regions, and comparing birds of the same stage of plumage, so far as I can see there are no discernible differences in color or markings. This is true of the juvenal plumage as well as the adult.

The measurements of the two series are as follows:

	Wing	Tail	Culmen	Tarsus
Average of eight males from southeastern Alaska,	68.37 (66.0–71.2)	63.75 (60.5–68.0)	12.34 (11.5–13.0)	23.0 (22.0–23.5)
Average of eight males from Vancouver Island,	66.04 (64.0–68.8)	64.9 (62.0–67.0)	11.85 (11.0–12.8)	21.87 (21.0–22.5)

Melospiza lincolni gracilis (Kittlitz)

Forbush Sparrow

Surprisingly rare. This species should occur as a common migrant throughout the region, but it was encountered by us on only two occasions. Miss Kellogg secured an adult male at Parksville on April 26 (no. 16246), and I shot an immature male in first winter plumage, at Errington, on September 11 (no. 16247). These are indistinguishable from comparable Alaskan specimens.

Passerella iliaca fuliginosa Ridgway

Sooty Fox Sparrow

Encountered at just two of our collecting stations and in very limited numbers. Evidently breeding in the mountains south of Alberni. They were seen and heard singing on the brush-covered slopes surrounding the Golden Eagle and King Solomon basins, and a few were noted in the willow thickets along the creek bottom, but they never ventured into the dense forests below. On Mount Douglas, July 14–16, several were heard singing in the brush just below the ridge. They were very shy, and clung to the thickets of dense underbrush, so that it was difficult to get sight of one. Singing birds were usually perched on a projecting branch, about the center of an impenetrable thicket of salmonberry or alder, into which they plunged at the first intimation of danger.

At Nootka Sound, the only other place where they were observed, a few were seen at the head of the Tahsis Canal, and also at Friendly Cove. Although at every opportunity special efforts were made to obtain specimens, I succeeded in killing only four birds, two males in juvenal plumage, at the Golden Eagle Basin, July 13 (nos. 16251, 16252), and two females at Friendly Cove, one (no. 16254, August 10) in juvenal plumage, the other (no. 16253, August 4) in first winter plumage. It is rather singular that none was seen on the east side of the island, where it might be expected to occur, at least as a common migrant.

There is some variation in the three juvenals, one of them being appreciably darker than the other two, but all three are

much darker colored and more heavily marked than any juvenal example of *townsendi* at hand. The one in winter plumage is of intensely deep coloration, about clove brown on the head, and very slightly more castaneous on the lower back. The lateral under surface of the body and the spots on the breast are also dull and sooty, with hardly an indication of reddish. It is markedly different from examples of *townsendi* in corresponding plumage.

Passerella iliaca insularis Ridgway

Kadiak Fox Sparrow

A single specimen, an adult female, taken by Miss Alexander at Parksville, April 26 (no. 16255). It was caught in a mouse trap, and was the only one of the species secured.

Passerella iliaca townsendi (Audubon)

Townsend Fox Sparrow

Two specimens taken by Miss Alexander at Parksville, April 26 and 28, were evidently migrants. The species was not again encountered until September 24, at Errington, when two fox sparrows were seen. The one secured proved to be of this subspecies. These two were the only ones noted in September, though they might be supposed to migrate commonly through the region. Possibly they pass through at a somewhat later date.

The three birds from Vancouver Island (nos. 16248–16250) are typical examples of *townsendi*, as compared with specimens from southeastern Alaska.

Pipilo maculatus oregonus Bell

Oregon Towhee

An abundant species on the east coast of Vancouver Island. Many were seen and specimens collected at all the various points visited from Nanaimo to Alberni—Parksville, Errington, French Creek, and Little Qualicum River. At Nootka the towhees were absent, together with many other common east coast birds.

In the vicinity of Beaver Creek and Alberni, in June, they were fairly numerous in the shrubbery, and at this time many young ones began to appear. At Errington, in September, they were also quite common.

This is a species that must have increased in numbers and greatly extended its range on the island with the settlement of the region. It was observed almost exclusively in the neighborhood of civilization, in the brushy second growth on abandoned clearings, in pastures, along the edges of fields, and in bushes by the roadside. None was seen anywhere in the more dense forests, or very far from human habitations.

Thirty-five specimens were collected (nos. 16256–16290), of which twenty are breeding adults, four in juvenal plumage, and eight immatures and two adults in fresh fall plumage. An adult female taken on September 5 is still in the old, abraded summer plumage, having hardly begun to molt, though others shot at the same time are in the fresh, winter plumage throughout.

In the darkest colored males the white markings of the upper parts are so reduced in size and number as to be hardly noticeable; the wing bars reduced to a row of small, disconnected spots, and the scapular markings nearly hidden under the feathers.

Zamelodia melanocephala (Swainson)

Black-headed Grosbeak

Observed with certainty only in Alberni Valley, though it may be supposed to occur throughout the southern and eastern portion of the island. In the vicinity of our Beaver Creek camp, during June, several were seen or heard singing at various times, probably not more than eight or ten individuals being noted altogether. They frequented the willow thickets along the stream, where they were undoubtedly breeding. Three specimens were secured at this point, two males and a female, all breeding adults. They exhibit the same characters as California examples of the species, rather than those of the Rocky Mountain birds, having the relatively small bill and, in the males, the post-ocular stripe commonly found in the former.

Piranga ludoviciana (Wilson)

Western Tanager

Met with at Alberni and in the adjacent Beaver Creek Valley during June. They were not abundant, but were only occasionally observed or heard singing in the tree tops. That the species

breeds in the region is shown by the fact that the ovary of a female bird collected June 4 contained partly developed eggs. Two were seen at Errington, one on August 31, the other on September 13. Three specimens were collected, an adult male and female (nos. 16294, 16295) and an immature male in first winter plumage (no. 16296).

Progne subis hesperia Brewster

Western Martin

At Nanaimo, on several occasions during June, western martins were seen in considerable numbers circling over the city, or sitting on telegraph poles or on the roofs of the buildings, where they were probably breeding. Not observed at any other point.

Hirundo erythrogastra palmeri Grinnell

Western Barn Swallow

Evidently a common summer visitant. Seen in numbers about Parksville and Errington, and also at Alberni, almost invariably in the vicinity of human habitations. A barn near the Little Qualicum River, and one at Errington, held many nests; at Alberni the bridge across the river south of town sheltered numerous pairs. No barn swallows were noted at Nootka, nor in any of the wilder regions visited.

The seven specimens collected (nos. 16297–16303), four males and three females, all breeding adults, are precisely like birds from southern Alaska, and together with these exhibit the intensely deep rufous coloration below, and the broad, deeply colored band on the forehead, characteristic of the western barn swallow as compared with true *H. e. erythrogastra* of eastern North America. The differences between these two forms are at least as well marked as those in several others given general recognition.

Tachycineta thalassina lepida Mearns

Northern Violet-green Swallow

A common species at most of the points visited during the summer. Many were seen and specimens collected at Parksville and Errington in April and May, and at Alberni and Beaver

Creek in June. At the latter point the numerous dead stubs standing everywhere in the woods, results of a forest fire of a previous year, afforded an abundance of nesting sites, and the swallows were frequently seen entering holes therein. A number were seen flying about in the streets of Nanaimo, in June. They were entirely absent from the higher mountains visited at the head of China Creek, and above Great Central Lake.

A few were observed at the head of the Tahsis Canal the end of July, the last that were seen. The species probably leaves for the south before the end of August, for none was observed at Errington in September when other migrants were passing through in numbers. Eleven specimens were preserved (nos. 16304–16314), all adults in breeding plumage.

Stelgidopteryx serripennis (Audubon)

Rough-winged Swallow

Several were seen on June 8 flying about a cut on the road between Nanaimo and Parksville. In the vicinity of Alberni they were fairly common, particularly along the nearby river. At this point, on July 21, many young birds were seen perched upon the telegraph wires stretched across the stream, where they were being fed by their parents.

One specimen was preserved (no. 16315), an adult male taken by Miss Alexander at French Creek on May 13.

Bombycilla cedrorum Vieillot

Cedar Waxwing

Seen in some numbers in the town of Alberni, but not met with elsewhere in the vicinity. I visited the town on numerous occasions in June, July and August, and never missed seeing cedar waxwings in the shade trees along the streets, or in the shrubbery in the gardens, but we never met with them in the wilder surrounding country. Seen at various points on Nootka Sound. On the Tahsis Canal several small flocks were seen during the last week in July. At Friendly Cove single birds and small flocks were noted almost daily. Most of these were in the trees and bushes in the more open spots about the houses, but one or two flocks were seen in the tops of cedar trees in the

dense woods. One shot in such a place was found to have its stomach filled with small beetles.

Two specimens of the cedar waxwing were preserved (nos. 16316, 16317), both adult males taken at Friendly Cove. They did not appear to be breeding birds.

Vireosylva olivacea (Linnaeus)

Red-eyed Vireo

An adult male (no. 16318) secured by Miss Kellogg at Beaver Creek on June 24. This was the only one of the species definitely identified, but at Alberni on June 9, and again on July 21, I heard notes that I believe were uttered by this vireo. The one secured had every appearance of being a breeding bird.

Vireosylva gilva swainsoni (Baird)

Western Warbling Vireo

One specimen taken at Parksville, May 3. At Beaver Creek it was fairly common, usually observed in the willows and alders along the banks of the streams. The only other point where it was met with was at Errington, where one was secured on September 13. Four specimens in all were taken (nos. 16319–16322), three adult males in breeding plumage, and an immature female in first winter plumage.

Lanivireo solitarius cassini (Xantus)

Cassin Vireo

Not observed on the west side of the island. One was taken at French Creek, May 19 (no. 16324), two at Errington, May 23 and 26 (nos. 16323, 16325), and another, an adult male in fresh autumnal plumage (no. 16326) at Errington on September 3. Another was seen at the latter point on September 22, evidently migrating.

Vermivora celata lutescens (Ridgway)

Lutescent Warbler

A common species, generally distributed, and met with in some numbers at every point where collecting was done. Thirty-two specimens were preserved (nos. 16327–16359), taken at

Parksville, Little Qualicum River, Errington, Alberni, French Creek, Golden Eagle Basin, and Nootka Sound. Two females taken by Miss Kellogg at the Little Qualicum River, May 7, and at Errington, May 24, are each marked as containing eggs in the oviduct. A juvenal, out of the nest, was collected at Errington on May 27; at Beaver Creek, during June, the young birds were quite abundant. In the Golden Eagle Basin, in July, old and young together were fairly numerous in the willow thickets, but I believe from their actions that they were at this time just moving up into the mountains from the valley below. At Nootka Sound, both at the Tahsis Canal and at Friendly Cove, lutescent warblers were seen daily during our stay, July 24 to August 11, and were evidently moving southward. At Errington, during September, they were observed throughout the month though not particularly numerous.

A male in first winter plumage, a migrant, taken at Errington September 11 (no. 16356), shows an evident approach to *V. celata celata* in the decidedly grayish coloration of the head and throat, but the general color elsewhere is of a brighter greenish-yellow than is seen in that race.

Dendroica aestiva rubiginosa (Pallas)

Alaska Yellow Warbler

At Beaver Creek, in the willow and alder thickets of the numerous swamps, yellow warblers were fairly numerous, the only place where we found them so. An immature male taken at Friendly Cove on August 7 (no. 16369) was the only one seen at this point, and was also the last individual of the species seen during the summer. The ten specimens collected (nos. 16360–16369) are indistinguishable from Alaskan examples of *rubiginosa* at hand.

Dendroica coronata hooveri McGregor

Alaska Myrtle Warbler

An adult male was taken by Miss Alexander at Parksville on May 2 (no. 16370). The species was not met with again until the middle of September, at the beginning of the southward migration, when it became very abundant. The first were seen

on September 13, a few scattered individuals in flocks of *D. auduboni*, but their numbers increased greatly during the next few days, and as the Audubon warblers were rapidly leaving at this time, conditions were reversed before the end of the month, when only an occasional *auduboni* could be found in the flocks of *hooveri*. The two species are so nearly alike in the winter plumage as to render it difficult to distinguish between them in life, especially in the case of the immature birds, but the call notes are sufficiently different to be distinguished without any difficulty.

D. coronata has been reported as occurring in the northern part of Vancouver Island in June (Brown, 1868, 420), but this was probably a mistake, as it is doubtful if the species breeds anywhere in the northwest coast region.

Five specimens were taken at Errington in September (nos. 16371–16375), all immatures in first winter plumage.

Dendroica auduboni auduboni (Townsend)

Audubon Warbler

A common species at the various points visited on the east side of the island in April and May. In the Beaver Creek Valley and about Alberni in June and July it was exceedingly abundant. Young out of the nest were observed at Errington, May 25; about Alberni, in June and July, they were numerous. An area along the water front in this vicinity, cleared of timber for a new town site seemed particularly attractive to these warblers, and scores of them were seen flitting about the piles of brush and timber. Nine-tenths of the birds were in the juvenal plumage.

No Audubon warblers were seen in the higher mountains, nor at Nootka Sound. They were abundant at Errington early in September, usually feeding in the willow thickets bordering the swamps, but after the middle of the month their numbers diminished rapidly, and though some were seen up to the last day of my stay (September 28), it was evident that they would soon all be gone.

Twenty-eight specimens were preserved (nos. 16376–16403), eighteen adults in breeding plumage, nine in juvenal plumage,

and one immature female (Errington, September 3) which has not quite completed the change from the juvenal into the first winter plumage.

Dendroica townsendi (Townsend)

Townsend Warbler

Seen on but a few occasions, and in very small numbers. Two collected, and one or two others seen by Miss Alexander at Errington, May 22 and 24, during the migration period, may have been transients, but as several were seen in Beaver Creek Valley during June the species probably breeds on the island. At Nootka Sound several small flocks were encountered near Friendly Cove, flitting through the shrubbery along the outer beach. Subsequently observed only at Errington, September 19, when an immature male was secured, evidently a migrant. Five specimens in all were preserved (nos. 16404–16408), two of these being adults.

A young bird, sex indeterminable (no. 16407), taken at Friendly Cove on August 7, is still largely in the juvenal plumage. Above it is dark olive-green, below soiled yellowish, with indistinct stripes on the sides. There is a dirty grayish superciliary stripe. The throat, breast, and superciliary stripe are invaded by numerous bright yellow feathers of the first winter plumage, just beginning to be acquired. The white-tipped greater and middle wing coverts are just beginning to appear. Another specimen (no. 16406, an immature female, Friendly Cove, August 6) has completed the change into the first winter plumage.

Oporornis tolmiei (Townsend)

Tolmie Warbler

A common migrant, numerous specimens being taken during April and May about Parksville, Little Qualicum River, and Errington. They were undoubtedly breeding in the Beaver Creek Valley, and about Alberni, for, though not at all numerous, occasional individuals were seen at various times during June. A single bird was seen in King Solomon's Basin (altitude 2000 feet), on July 5, and several were observed at the head of the

Tahsis Canal between July 24 and August 1. During the fall migration it was met with on but two occasions, single birds being seen at Errington on September 2 and 10, respectively.

Sixteen specimens were preserved (nos. 16409–16424), all adults in breeding plumage.

Geothlypis trichas occidentalis Brewster

Western Yellowthroat

Common in the swampy meadows at Errington and at Beaver Creek. Not met with elsewhere, though at Nootka Sound at least, there was plenty of ground suited to the species. Young out of the nest were taken at Beaver Creek on May 30, and subsequently during June. On June 14 Miss Kellogg found a nest with four eggs (no. 1076). It was in a clump of grass at the edge of a small stream flowing through an open meadow, and was built of grass blades, lined with finer stalks of grass and one or two horse hairs.

Yellowthroats were abundant at Errington early in September, evidently migrating; by the end of the month they had nearly all disappeared.

Thirty-seven specimens were collected (nos. 16425–16461), twenty-one summer adults, seven juvenals, and seven immatures and two adults in fresh winter plumage.

This series of yellowthroats does not coincide with the accepted descriptions of *Geothlypis t. arizela*, the form supposed to inhabit the region. In fact, none of the series of western yellowthroats in this Museum (except *G. t. sinuosa*) lend themselves to the divisions of the species as generally accepted.

The latest authority (A. O. U. *Check-List*, 1910, pp. 322, 323) gives the breeding range of *G. t. occidentalis* as follows: "Breeds . . . . from central Alberta, southern Saskatchewan, and South Dakota to southeastern California, northeastern Lower California, Chihuahua, and western Texas"; of *G. t. arizela*: "Breeds . . . . from southern British Columbia to southern California and east to Fort Klamath, Oregon."

The differences between *occidentalis* and *arizela*, according to the original describer of the latter (Oberholser, 1899, p. 256), and according to Ridgway (1902, p. 670), are briefly as follows:

Occidentalis—larger; coloration brighter; with yellow of underparts usually more orange; whitish posterior margin of black facial mask, broader. *Arizela*—smaller, with much smaller bill; coloration duller, with yellow of underparts less orange; whitish margin posterior to black mask, narrower.

Occidentalis was described from Truckee River, Nevada (Brewster, 1883, p. 159). There are no exact topotypes available, but I have considered a series of eleven breeding birds from Humboldt County, Nevada, as typical of the race. Comparing these with the Vancouver Island adults I can appreciate absolutely no differences of color or pattern, while the differences in size are too slight to merit recognition by name. Chapman, in commenting upon some yellowthroats from British Columbia (1890, p. 151) also expresses his inability to distinguish between birds from the coast and from the interior.

There appear to be, however, two races of yellowthroats on the Pacific Coast with differences such as are supposed to distinguish *occidentalis* and *arizela*. The breeding bird of southern California and southern Arizona is of very bright colors, sometimes with the yellow of the ventral surface extending over almost the entire abdomen and flanks. This bird was designated *Geothlypis t. scirpicola* by Grinnell (1901b, p. 65; type from El Monte, Los Angeles County, California), a name now relegated to the synonomy of *G. t. arizela* (see Ridgway, 1902, p. 672)—which is described as a small, dull-colored form!

The material at hand points toward the following disposal of these two western races of yellowthroats, as being probably the correct solution of the question:

Occidentalis—small billed, and duller colored, with the yellow of the throat and breast not extending posteriorly over the flanks and abdomen; whitish posterior margin of black facial mask narrow and rather sharply defined. Range (approximately) from central Nevada and California north through British Columbia (including Vancouver Island) to southeastern Alaska (Swarth, 1911a, p. 101). *Arizela* thus becomes a pure synonym of *occidentalis*.

Scirpicola—with larger bill and brighter colors; yellow of throat and breast brighter, extending over the entire abdomen,

and sometimes tinging the flanks. Broad whitish margin posterior to the black facial mask, not sharply defined but frequently extending backwards over the entire crown, and to the nape. Ranges through southern California and southern Arizona. It is possible that the bird found in southern Arizona is recognizably distinct from *scirpicola*, but the material I have at hand (four adult males, breeding birds, San Pedro River, Cochise County, Arizona) is not sufficient to determine this. It shows the extreme accentuation of the color characters of *scirpicola*, thus approaching the Mexican form *G. t. melanops*, and is noticeably different from typical *occidentalis*, which occurs commonly in the same region as a migrant (see Swarth, 1904, p. 56).

Following are measurements of breeding males of *G. t. occidentalis* and *G. t. scirpicola*, from various localities:

	Wing	Tail	Culmen	Tarsus
Geothlypis t. occidentalis				
Eight males from Vancouver Island,	54.1	51.1	10.07	18.4
Seven males from Humboldt Co., Nevada,	55.8	53.0	10.8	20.4
Five males from southeastern Alaska,	55.1	51.3	10.8	19.7
Geothlypis t. scirpicola				
Five males from Los Angeles Co., California,	54.6	51.1	11.2	19.5
Four males from Cochise Co., Arizona,	55.6	51.5	11.4	18.9

Wilsonia pusilla pileolata (Pallas)

Pileolated Warbler

Seen at various points, but always in limited numbers. Specimens taken at Errington and the Little Qualicum River in May were probably migrants, but a few were seen about Alberni, and in the Beaver Creek Valley in June, when they were undoubtedly breeding. The few that were seen in the willow thickets in the Golden Eagle Basin in July had, in their manner of occurrence, the appearance of being casual visitants to the region, probably migrants from the valleys below.

At Friendly Cove, early in August, the species was more abundant than at any other point visited, and a few were seen daily in the willows and shrubbery surrounding the lake back of the village. It was not seen at any point after we left Nootka Sound.

Thirteen specimens were collected (nos. 16462–16474), nine adults and four immatures. An adult male shot at Friendly Cove, August 6, is in fresh winter plumage throughout, but an adult female taken the same day has not yet begun to molt from the old breeding plumage.

Anthus rubescens (Tunstall)

Pipit

Met with only while migrating southward, in September. The first was observed at Errington on September 3, and from then on their numbers increased rapidly; toward the end of the month vast flocks frequented the open fields and swampy pastures of the vicinity. On September 7 and 8, a few were seen near the summit of Mount Arrowsmith, on the heather-covered slopes above the timber, at an altitude of about 5000 feet.

One bird observed at this point flew to the top of a stunted hemlock tree some fifty feet high, where it remained for some time sitting on the topmost branch. This was an action I had never before seen performed by a pipit, and I was uncertain what the bird was until he finally flew down to earth again close enough to me to be easily recognized.

One specimen of the species was preserved (no. 16475), an immature male in first winter plumage.

Cinclus mexicanus unicolor Bonaparte

Dipper

Fairly common in suitable localities. A nest containing five young was found on the Little Qualicum River on May 15. It was built of moss, and was located among the roots of a tree, on a bank overhanging the river. At this time the young were about ready to leave the nest. Dippers were seen quite frequently at the head of China Creek in July, possibly, however, all belonging to a single family. Four or five were usually seen at once, wandering up and down the stream for long distances, and seldom staying long in one place. Many were observed along the various streams emptying into the head of Tahsis Canal, probably three or four broods within a radius of a mile or two. A single bird

was seen on the shore of Great Central Lake, August 18, the only individual seen anywhere except along swiftly rushing streams.

Vancouver Island, with its innumerable streams, large and small, affords peculiarly congenial surroundings to the dipper, and it is abundant and of general distribution.

Ten specimens were collected (nos. 16476–16485), three adults and seven in juvenal plumage.

Thryomanes bewicki calophonus Oberholser

Seattle Wren

Apparently restricted to the east side of the island. Although occurring in numbers at the various points visited in the vicinity of Parksville and Errington, it was entirely absent in Alberni Valley, some thirty miles to the westward, a region not obviously different in its characteristics.

Young, out of the nest, were taken at French Creek May 19, and later. Probably in some cases two broods are raised in a summer, as young birds at about the same stage of development were collected in the last week of May and early in September. The birds were quite common at Errington during the first two weeks in September, but by the end of the month nearly all had disappeared.

Eighteen specimens were collected (nos. 16486–16503), eight breeding adults, seven in juvenal plumage, and two immatures and one adult in fresh winter plumage.

Troglodytes aëdon parkmani Audubon

Western House Wren

Fairly abundant at Parksville and neighboring points the last week in April and during May. Seen in Alberni at various times in June, and also in the Beaver Creek Valley. Just below our camp at the latter point a nest was found in a huge, dead stub by the roadside. On June 9 it contained young birds, as was evident from the sounds, but the entrance was too small and the hole too deep to admit of further investigation. The species was not seen at Nootka Sound, nor in the higher mountains we visited. They must leave for the south at a rather early date in

the fall, for the last seen was a single bird taken at Errington on September 1.

Ten specimens were taken (nos. 16504–16513), eight adults, one in juvenal plumage, and a young male molting into first winter plumage. They are quite indistinguishable from comparable specimens from various points in California and Arizona.

Nannus hiemalis pacificus (Baird)

Western Winter Wren

A few specimens taken at Parksville and the Little Qualicum River in April and early in May were very probably migrants through this region, since none was collected here toward the end of May. Elsewhere during the summer, they were found at a somewhat higher altitude. At Beaver Creek I saw a few, at elevations where the Hammond flycatcher, Canada nuthatch, and creeper replaced the Traill flycatcher, yellow warbler, song sparrow, and house wren.

At the head of China Creek (1900 feet) winter wrens were quite abundant, being one of the very few species that were at all numerous in the dark, gloomy forests of that region. They frequented the creek bottoms and tangles of windfall and drift, and were entirely absent from the more open and sunny areas found in the basins and on the ridges.

At Nootka Sound, both at Friendly Cove and the Tahsis Canal, they were decidedly scarce, not more than four or five being seen at either place. A single bird was seen at the head of Great Central Lake, August 22. At Errington, in September, it was not seen until the 22nd; during the last week of the month about six or eight were observed, apparently migrating.

Eight specimens of the winter wren were preserved (nos. 16514–16521), six summer adults and two in juvenal plumage.

Certhia familiaris occidentalis Ridgway

Tawny Creeper

Seen in small numbers at Beaver Creek in June and at the head of China Creek in July, at both points in flocks composed each of a single family, the young attended by their parents. At Friendly Cove, early in August, there were a few seen from

time to time at the edge of the woods along the beach. At Errington in September, they were evidently migrating, and in increasing numbers toward the end of the month. Usually seen in mixed flocks of chickadees, nuthatches and kinglets, the whole assemblage keeping together and moving rather rapidly through the forest.

Thirteen specimens were taken (nos. 16522–16534), four summer adults, five juvenals, and four immatures in freshly acquired winter plumage.

Sitta canadensis Linnaeus

Red-breasted Nuthatch

A fairly common summer resident of the western side of the island at least; possibly of general distribution, but from its habits as observed by us, very difficult to secure, or even to see. At Beaver Creek during June, the familiar nasal note was frequently heard, but always from the tops of the tallest fir trees, far out of gun range, and it was long before I had so much as a glimpse of one flitting from tree to tree. They were not observed in the dense woods at the head of China Creek, but on July 14–16, on the summit of the neighboring Mount Douglas, several were met with in the open woods along the ridge.

At Friendly Cove they were again heard calling in the tree tops, but only one or two were seen and none secured. They were fairly abundant at Errington in September, but under the same disadvantageous circumstances as elsewhere, and though seen or heard nearly every day I was able to secure only three specimens. These are two males and a female, all adults in fresh winter plumage (nos. 16535–16537).

Penthestes rufescens rufescens (Townsend)

Chestnut-backed Chickadee

About the most abundant and most generally distributed species of bird encountered. Met with at every point visited, sometimes in considerable numbers. A female taken at Parksville, April 28, contained eggs nearly ready to be laid. The first young out of the nest was taken at Beaver Creek, May 31, and thereafter the broods of young were seen everywhere in the

woods. The species was occasionally met with in the woods at the head of China Creek, but was not common there. At Nootka Sound it was not common at the head of the Tahsis Canal, though quite abundant at Friendly Cove. A few were seen at the head of Great Central Lake.

By September the flocks encountered were of larger size, being probably composed each of several families. Such flocks were frequently met with in the woods at Errington.

An adult female taken at Friendly Cove on August 9 is just beginning the post-nuptial molt; adults shot at Errington on September 19 and 24 have completed the change, except for a few scattered pin feathers. The young birds molt from the juvenal into the first winter plumage before the end of August; those taken during the first week in September are in the first winter plumage throughout, and externally are indistinguishable from adults.

Forty specimens of this chickadee were collected (nos. 16538–16577), twenty summer adults, fifteen juvenals, and two adults and three immatures in fresh, winter plumage. In coloration these Vancouver Island birds are indistinguishable from the series at hand from southern Alaska (the Sitkan district), but they have decidedly longer bills. In this respect they show an interesting approach toward *Penthestes r. rivax* of Prince William Sound (Grinnell, 1910, p. 414), though the character is not quite so accentuated as in that race. The birds of the Sitkan district, occupying an intermediate region, have thus much smaller bills than the birds to the northward or to the southward. In other external measurements and proportions the Vancouver birds and the Sitkan district birds are indistinguishable.

Regulus satrapa olivaceus Baird

Western Golden-crowned Kinglet

A fairly common species, and quite generally distributed. Adults were seen and taken at points near Parksville; at Beaver Creek adults and juvenals in flocks together were frequently encountered. A young female collected August 7 at Friendly Cove has nearly accomplished the molt into the first winter

plumage. At the head of China Creek, in July, the species was met with in some numbers, but always on the high slopes and ridges leading up to Mount Saunders and Mount Douglas, and never in the darker and more densely wooded cañons. It was fairly common in the woods at Nootka Sound.

Six specimens were collected (nos. 16578–16583), four summer adults, one juvenal, and one in first winter plumage.

It is rather singular that the Sitka kinglet (*Regulus calendula grinnelli*) was not met with at any time during the summer, though it certainly should occur in this region, at least as a migrant.

Myadestes townsendi (Audubon)

Townsend Solitaire

Observed on but three occasions, each time a single bird. One was seen on the Beaver Creek road, about five miles north of Alberni, on June 9; another along the road near Errington on June 30; while a third was secured at Errington on September 23 (no. 16584). The last mentioned was feeding in a wild cherry tree, and had its stomach filled and its intestines discolored with the fruit. It is an immature bird in first winter plumage, a few spotted feathers of the juvenal plumage still lingering on the lower surface of the body.

The fact that the species was present in June would seem to imply that it was breeding in the region, but our observations would indicate that it occurs in very small numbers.

Hylocichla ustulata ustulata (Nuttall)

Russet-backed Thrush

One of the most abundant species of birds encountered. Specimens were taken on the east coast in May (the first at Errington, May 19), while in the vicinity of Alberni and Beaver Creek in June the ringing song could be heard issuing from every clump of underbrush. In the Golden Eagle Basin (2000 feet) during July it was seen daily, but was not nearly so abundant as at lower altitudes. A few were seen on the Tahsis Canal, and at Friendly Cove it was quite numerous, particularly in the thickets surrounding the little lake near the village.

A nest was found at the head of Tahsis Canal, July 31. It was placed in a bush at the edge of the woods, about five and one-half feet from the ground. The nest was quite uncoucealed by any vegetation, but bore such a strong resemblance to a bunch of moss, such as could be seen on every tree and bush, that it was only the sudden departure of the parent bird that disclosed it. A few small fir twigs enter into the composition of the structure, but it is mainly composed of green moss, with a very slight lining of small rootlets and dried leaves. It contained three young birds, not yet able to fly, and one rotten egg.

The russet-backed thrush must leave the region rather early in the fall, for none was seen after leaving Nootka, August 11, though it was so abundant at that point. The ensuing two weeks were spent at Great Central Lake, a region poorly adapted to the species and where I did not expect to see it. When we reached Errington, at the end of August, I thought it would surely be present as it had been early in the summer, but none was seen or heard anywhere.

Thirty-four specimens were preserved (nos. 16585–16618), nineteen adults and fifteen in juvenal plumage. An adult male shot at Friendly Cove on August 10 is far advanced in the postnuptial molt, with most of the flight feathers gone and with stubby tail, less than an inch long, but none of the other seven adults taken here have even begun to molt. Young birds taken at the same place during the first two weeks in August are some of them in juvenal plumage purely, while the others have nearly accomplished the change into the first winter plumage.

Hylocichla guttata nanus (Audubon)

Dwarf Hermit Thrush

Of unexpectedly rare occurrence in the region. A single bird taken by Miss Kellogg at Parksville, April 26 (no. 16619) was the only hermit thrush observed anywhere until I reached Nootka Sound in August. They were not common at this point; I saw none on the Tahsis Canal but secured six (nos. 16620–16625) in the vicinity of Friendly Cove between August 4 and 10, and saw and heard several others. Those secured are all young birds, in the juvenal plumage or molting into the first winter plumage.

so the species may be said to breed at some points at least on the west coast of the island. Three were collected at Errington, an immature male (no. 16626) on September 15, and an adult male (no. 16627) and immature female (no. 16628), on September 22, all that were seen here.

These Vancouver Island hermit thrushes present an extreme of dark coloration. Compared with birds from the Sitkan district, Alaska, they are appreciably darker throughout, this in all stages but most noticeably so when birds from the two series in fresh winter plumage are compared. A juvenal female from Nootka, which has almost completed the autumnal molt has the upper parts dark, olivaceous brown, between sepia and bistre; the upper tail coverts and rectrices, mummy brown.

There is as much difference in coloration between these bir 's and specimens of *H. g. nanus* from the Sitkan district, as between the latter and examples of *H. g. guttata* from the Prince William Sound region.

Planesticus migratorius caurinus Grinnell

Northwestern Robin

Robins were abundant at nearly every point visited, and apparently breed throughout the region. At Parksville, during the last week in April, they were, as observed by Miss Alexander and Miss Kellogg, the most abundant species of bird, frequenting the vicinity of the farm houses, and also the woodland. They were breeding at the time, as some were seen carrying food to the young. Common about Alberni and in the Beaver Creek Valley. In the Golden Eagle Basin they were seen daily, but in small numbers, but I found them quite numerous on the comparatively open ridges on the south side of Mount Douglas (about 4000 feet).

In the village of Friendly Cove, at Nootka Sound, robins were exceedingly abundant about the houses. They were probably the most abundant species of bird at this point, certainly the most conspicuous.

There were a few in the pastures about Errington early in September, but after the middle of the month they increased greatly in numbers. There were many wild cherry trees in the

vicinity of our camp, loaded with fruit at this time, and during the last two weeks in September they were filled from morning to night with garrulous, quarreling flocks or robins.

Twenty-six specimens were collected (nos. 16629–16654), eighteen summer adults, seven in juvenal plumage, and one young male molting into first winter plumage. The series of robins now at hand from the northwest coast region emphatically justifies the recognition of the race *caurinus* (see Grinnell, 1909, p. 241). There are fifty specimens in the Museum collection, both in adult and juvenal plumage, and in neither stage is it to be confused with *P. m. propinquus*, to the synonomy of which the name *caurinus* is at present relegated (see Fifteenth Supplement A. O. U. *Check-List*, 1909, p. 302). The dark coloration of t e coast race distinguishes it at once, and this is quite as apparent in the juvenals as in the adults. There are at hand comparable series of young birds from Vancouver Island and from the Warner Mountains, California, and the difference in the general tone of coloration, both above and below, is quite noticeable. The latter series is assumed to be representative of *propinquus;* the type locality of the subspecies is Laramie Peak, Wyoming.

Ixoreus naevius naevius (Gmelin)

Varied Thrush

Not observed on the east coast during April and May. First met with at the upper end of the Beaver Creek Valley, about the center of the island, where they were fairly common and breeding. Full-grown young were flying about early in June, and became more numerous toward the end of the month. At the head of China Creek, in July, we found the varied thrush one of the very few species of birds that seemed at home in the dense forests of this region. They were by no means common, but were conspicuous through the absence of nearly all other species. Pairs of birds were encountered at intervals, extremely solicitous for the young, which at this altitude were hardly able to fly at a time when broods hatched in the lower valleys were caring for themselves. Full-grown juvenals were observed in the willow thickets of the open basins, and it seemed to me that these had

probably moved up into the mountains from the lower valleys. They were seen together with other species that appeared to be migrating in a similar manner—song sparrows, lutescent and pileolated warblers, and robins. On the higher slopes and on the summit of Mount Douglas (July 14–16), varied thrushes were observed in greater numbers than was ever the case in the dark cañons below.

At Nootka Sound they were decidedly scarce during our stay, and the few that were seen were extremely wild. Although a special effort was made to obtain a good series from this point, because of its being the type locality of Gmelin's *Turdus naevius*, I was able to secure only five specimens, one adult male and four young birds, three of the latter being well advanced in the post-juvenal molt.

On August 28 we moved to Errington, on the east coast. There were absolutely no varied thrushes in the lowlands in the vicinity at this time, but on September 6–8, which we spent on Mount Arrowsmith, we observed them in considerable numbers on the higher slopes of the mountains. They first appeared in the lowlands on September 11, when several were seen; from then on they were seen in small numbers daily until September 20, when they suddenly became abundant.

Sixteen specimens were preserved during the summer (nos. 16655–16670), of which three are adult males, one an adult female, and the remainder young birds, some in the juvenal plumage and others variously advanced in the post-juvenal molt.

Sialia mexicana occidentalis Townsend

Western Bluebird

Fairly common on the east side of the island, where it was met with in some numbers in the vicinity of Nanaimo and Parksville. The western and northern limit of the species is reached about at Alberni. I saw several near this town on June 9, and Miss Kellogg saw a single bird at Beaver Creek, some fifteen miles to the northward, on June 23, the only place on the west coast where it was met with. Next observed at Errington in September. They were not at all numerous then, but an occasional small flock would appear from time to time during the

month. The wild cherries were an attraction to them, as to several other species of birds, and they were generally seen in the vicinity of these trees.

Eleven specimens were collected (nos. 16671–16681), five males and three females in summer plumage, and two adult females and one young one molting into winter plumage. Of the five males three have no chesnut on the back, one has a little on each shoulder, and one a little on the middle of the back.

THE MAMMALS

CHECK-LIST OF THE MAMMALS

1. Odocoileus columbianus columbianus (Rich.)
2. Sciurus hudsonius vancouverensis Allen
3. Marmota vancouverensis Swarth
4. Castor canadensis leucodontus Gray
5. Epimys norvegicus (Linn.)
6. Peromyscus maniculatus austerus (Baird)
7. Evotomys caurinus Bailey
8. Microtus tetramerus (Rhoads)
9. Felis oregonensis Raf.
10. Canis occidentalis Rich.
11. Lutra canadensis periclyzomae Elliot
12. Gulo luscus Linn.
13. Lutreola vison energumenos (Bangs)
14. Putorius streatori C. H. Merriam
15. Mustela caurina C. H. Merriam
16. Ursus americanus americanus Pall.
17. Procyon psora pacifica C. H. Merriam
18. Sorex vancouverensis C. H. Merriam
19. Myotis lucifugus alascensis Miller(?)
20. Eptesicus fuscus (Beauv.)

GENERAL ACCOUNTS OF THE MAMMALS

Odocoileus columbianus columbianus (Richardson)

Columbian Black-tailed Deer

Abundant nearly everywhere, though from accounts I heard of conditions as they existed twenty or twenty-five years ago, deer were far more numerous at that time. At Beaver Creek, during June, many were seen, mostly does, sometimes accompanied by their fawns. A buck shot at this point on May 30 was shedding the winter coat, and had acquired a little of the red summer hair. The horns were grown out about six inches.

At the Golden Eagle Basin, in July, we saw numbers of deer daily. Despard counted twenty in about four hours one morning, and it was a common occurrence to see them crossing open spots on the hillside opposite camp while we were at breakfast. At this time the big bucks were mostly on the high, snow-covered ridges, in comparatively open country, presumably to protect their tender antlers from injury which they would be apt to

receive in the forests below. The does were usually lower down, and I came across several spotted fawns, some apparently but a few days old, in thickets along the streams. But one adult was killed at this point, on July 1, and this one, together with many others seen at close enough range to distinguish details of their condition, was shedding the winter coat so as to be nearly naked in spots, while but little of the summer coat had as yet grown in. The deer in the lower valleys were already in the red summer pelage.

At Nootka Sound deer were remarkably scarce. I saw fresh tracks of a single animal at the edge of the lagoon near Friendly Cove, and Despard saw a little fresh sign at the Tahsis Canal, but no deer were encountered at any time. Toward the end of our stay the Indians brought in one that they had killed on an island in the sound.

Deer were also extremely scarce at the head of Central Lake, but at the other end, between the lake and Alberni, I saw an abundance of fresh sign.

During September, in the vicinity of Errington, we saw some almost daily. They came into the grain fields in the neighborhood of our camp every night, and I frequently saw tracks about the barns and outhouses. Seven specimens were collected here, between August 30 and September 16. These were just beginning to lose the summer coat, patches of gray hair appearing on various parts of the body; the bucks still had strips of dried "velvet" adhering to their horns.

The effect of the weather on the habits of the deer was quite noticeable here. On bright, sunny days there were none to be seen, though from the numerous fresh tracks it was evident that there were many in the vicinity, but if there was even a light shower one was sure to encounter deer in the woods before going very far. All the bucks that were seen here were small, or of medium size, but on Mount Arrowsmith, September 6 to 8, several large bucks were observed, and from the tracks seen it was apparent that there was a much greater proportion of large-sized animals at this altitude than in the lowlands.

It was noticeable throughout the summer that deer were most abundant in the regions that had been partially settled and

farmed. In such places, on the outskirts of civilization, the wolves and panthers are hunted and driven back, and the deer prosper accordingly, while in the wilder regions these predaceous animals are abundant enough to be a serious menace to them.

Eleven specimens were preserved (nos. 12052–12061, 12603), two adult males, two adult females, three immature males (shot in September, one of them still retaining some ill-defined spots), two spotted fawns, one skull of an adult male, and a fragment of a skull with a deformed antler.

Sciurus hudsonius vancouverensis Allen

Vancouver Island Squirrel

Generally distributed and, in places, quite abundant. Miss Alexander and Miss Kellogg found them common on the east coast in April and May, and secured specimens at Parksville, French Creek, and Little Qualicum River. In the Beaver Creek Valley they were not so abundant. This country had been burned over in years past, and it may be that the altered conditions were not as favorable to the species as in places where there was not so much dead and burned timber. Here, after the middle of June, young squirrels began to appear, the first that were seen. In the Golden Eagle Basin there were a few, usually observed near the edge of the woods, in the vicinity of the more open ground. This was the highest altitude (about 2000 feet) at which I saw them. At Nootka Sound they were seen daily, both at the Tahsis Canal and at Friendly Cove, but never in any numbers. When we returned to Errington in September red squirrels were more abundant than I had seen them at any other point. They were seen everywhere in the woods and at the edges of the clearings, the bulk of them evidently young and not yet full grown, and almost always exceedingly tame.

We collected twenty-eight specimens during the summer (nos. 12062–12089), all but two being adults. Those taken on the east coast in April and May are all in the winter pelage. Of eight collected in Beaver Creek Valley from May 31 to June 25, one (no. 12074, May 31) is in complete summer pelage, two (nos. 12078, 12079, June 23) are in winter pelage, and the others variously advanced in the change, and showing molt lines and irregular patches of old and new hair over parts of the body. Of

the two specimens taken in the Golden Eagle Basin, one collected on July 3 is in summer pelage, the other, July 4, in complete winter pelage, rather worn in appearance, and just beginning to change to the summer coat. One taken at the Tahsis Canal July 31 is still entirely in the winter coat. All the others taken at this point are in summer pelage.

A comparison of these Vancouver Island squirrels with a series in corresponding pelage from southeastern Alaska, previously referred by me to *vancouverensis* (1911a, p. 120) reveals certain appreciable dissimilarities. The squirrels from the two regions are hardly distinguishable in summer pelage, but in the winter coat the following differences are apparent: typical *vancouverensis* is darker above, nearly uniform dull chestnut, with the reddish stripe ill-defined; the tip of the tail is much more extensively black; the center of the tail, on the ventral surface, is decidedly grayish. Alaskan specimens are brighter colored, with a fairly well defined, bright hazel dorsal stripe; center of tail, below, reddish, nearly as bright as the upper surface. In all pelages the Alaska squirrels have the tip of the tail much less extensively black, and have the black lateral stripe on the body much more prominent.

Thus in color they are intermediate between typical *vancouverensis* and *petulans*, and a comparison of the skulls shows the same to be true of the cranial characters. *Petulans* has a sharp indentation on the orbital arch (see Osgood, 1900, p. 27, pl. 5) which is nearly or quite obsolete on the Vancouver specimens at hand. On nearly all the skulls from southeastern Alaska it is quite as apparent as in typical *petulans*. As the red squirrel ranges uninterruptedly along the northwest coast it is, of course, to be expected that intergradation between the races should appear in the intermediate localities.

External Measurements of *Sciurus h. vancouverensis*

	Length	Tail	Hind foot
Eight males from Vancouver Island,	293.5 (280–310)	111.5 (92–124)	48.12 (45–50)
Eight males from southeastern Alaska,	312.37 (308–317)	125.37 (123–128)	50.75 (49–53)
Eight females from Vancouver Island,	302.37 (285–313)	117.0 (110–124)	48.87 (45–51)
Eight females from southeastern Alaska,	308.25 (292–321)	123.0 (114–132)	51.25 (46–55)

Marmota vancouverensis Swarth

Vancouver Island Marmot

We found marmots in the high mountains south of Alberni, and nowhere else. In the more open portions of the King Solomon and Golden Eagle basins, and on the surrounding peaks and ridges they were fairly abundant, but we met with them at no other point, nor could we learn of their presence in other parts of Vancouver Island. Of course the greater part of the interior of at least the northern two-thirds of the island is a wilderness of forest and glacier-covered mountains, of which very little is known, and the species may possibly be found elsewhere, but the summer's investigations proved at least that it does not occur in all apparently suitable localities. Mount Arrowsmith, in the same range of mountains, and in an air line not more than fifteen miles distant from the peaks where we found the marmots, was ascended later in the summer and no trace of the animals found, though conditions were apparently favorable. The same was true of the high mountains we visited northwest of Great Central Lake.

On the west coast of the island I talked with several timber cruisers, men who had been exploring the wilder parts of the island for years, and could find none who had ever seen a marmot.

We found them in the mountains at the head of China Creek, some twenty miles south of Alberni, in the Golden Eagle Basin, and King Solomon Basin, and on the surrounding slopes and ridges. They were most abundant on Mount Douglas, the peak to the west of King Solomon's Basin. Wherever the ground was bare of timber, or but sparsely covered, as is the case over extensive areas at this point, the marmots had established themselves, burrowing under the rocks, and apparently never wandering very far from home.

They were vigilant and unapproachable; all secured were shot by Despard with his 30–30 rifle, as we were never able to approach within shot-gun range, and it was impracticable to use traps. They were also very tenacious of life, and it was necessary to use soft-nosed bullets on them, as those shot with the hard points struggled down their burrows in every instance. These are large

enough and descend steeply enough to permit the animals to tumble in and out of sight and reach with very little effort, and the ground is far too rocky to permit of their being dug out. Their extreme wariness is correlated with conspicuousness, for the dark brown pelage shows in marked contrast against either gray rocks or green grass. The only condition under which they could be regarded as colored protectively was when one lay still, sprawled on a boulder in the sunshine; one or two seen thus might easily have been passed by unnoticed as bunches of brown moss on the rocks. They whistled but seldom, only one or two being heard during the three weeks we spent in their territory.

At the time we were in the region, the first three weeks in July, no young ones had yet emerged from the burrows, but several of the females secured were nursing. They are thus somewhat later in their breeding than *M. caligata*, as observed in southern Alaska, where young were seen running about the middle of June. The period of hibernation must be long in these mountains, for the snowfall is heavy, covering the ground to a great depth. Even at the end of July there were snow banks twenty or thirty feet deep lingering in many places.

Eleven specimens were collected (nos. 12090–12100), five males and six females, all adults. Two complete skeletons were preserved. Two of the marmots are in fresh pelage, the others variously advanced in the change from the old coat to the new. The color of the fresh pelage is very dark brown, above and below, the tip of the nose and chin and an irregular streak along the center of the breast and abdomen, white; a few white hairs scattered over the back. The old, faded pelage is much paler, nearer a cinnamon or wood brown. For a detailed description and measurements of the species see Swarth, 1911b, p. 201.

Castor canadensis leucodontus Gray

Pacific Beaver

As a result of a number of years of protection beavers have multiplied on Vancouver Island so as to be really abundant in many places. We found them at several points in greater or less numbers, and at other places saw remnants of dams and houses as evidence of the former occurrence of the species. There was

a small colony at a point near Errington, but we found them in far greater numbers at Beaver Creek, near Alberni, and here secured a series of specimens. There was old beaver work along the streams throughout this valley, and from the size of some of the old dams they must have existed here in immense numbers at one time, but at present, though there are a good many left still, they are more scattered, apparently not more than one or two families at any one point, and such groups separated by intervals, sometimes of several miles.

Nearly all the smaller streams were obstructed by their dams, and most of the adjoining low lying land flooded as a consequence. Most of our specimens were taken from two houses, which I, together with Despard, examined and photographed on June 22. They were surrounded by shrubbery to such an extent as to be difficult of access, the water in which they were standing being grown up with weeds and grasses, and the dryer ground adjoining with willows and alders and a few scattered fir trees, and with tall ferns everywhere underfoot. The first house (see pl. 3), about fifty yards up-stream from the dam, was built over a huge, moss-covered log lying in the water. Its greatest height was about five and a half feet, that is, from the surface of the water; from the top of the log it was built up about three feet. The greatest outside diameter was about ten feet. The material used, such as could be seen, was sticks cut into lengths of from three to ten feet, the largest about three inches in diameter. No mud was visible anywhere on the outside.

The second house examined was on an abandoned farm, the ground now covered with second growth timber to such an extent that neither farm house nor barn was visible at a greater distance than a few yards. The beaver house was in what had been a grain field several acres in extent, now flooded by the beavers to a depth of several feet, and thickly grown up with small willows. This house was somewhat larger than the first, about six or seven feet high, but built in deeper water; the same sort of materials went into its construction, but it was rather more symmetrically shaped.

Both houses were occupied at the time by several beavers, at least, and we could plainly hear them grunting and snuffling

within. We did not examine into the internal arrangements of the structures, as we were desirous of obtaining more specimens, but made our observations and took our photographs with the least noise possible.

At another part of the valley there was a pond formed by a prodigiously large beaver dam, evidently once occupied by a large number of animals, but at the time of our visit apparently by one solitary old beaver, who was far too wary to venture into a trap.

It was no easy task to obtain an adequate series of specimens of this animal, but one calling for an immense amount of labor and no small degree of skill in trapping; and we were fortunate in having in the party a man possessing the requisite ability and energy. It took days of tramping before any occupied houses were found, while the intervals at which they were scattered and their distance from our camp made it an all-day tramp to make the round of the traps. Then, too, it was disagreeable work, wading for hours in the cold streams, or struggling through dense and frequently dripping vegetation.

When they were finally located several discouraging days passed before any were trapped. Finally Despard obtained some oil of rhodium (largely used among trappers to attract the smaller carnivores, but something of an experiment as regards beaver) and secured one the first night he used it. After that they came more easily, for the castor obtained from the first was a most efficient lure to draw others into the traps.

Steel traps were used, placed in shallow water or on the dams, and set in such a way that the captured animal could flounder into deep water, where he would speedily drown, hampered as he was by the weighted trap. Otherwise an adult beaver will invariably cut off the pinioned foot and make his escape. One of the younger animals secured had the front leg and breast cut to ribbons, as Despard supposed, by an older one endeavoring to effect its release.

Ten specimens were collected at Beaver Creek during June (nos. 12101–12110), three adult males, three adult females, and four juvenals. Besides these, two young ones were caught, too small to drag the traps into deep water; and as they were un-

injured they were brought to camp alive and kept for several days. One of these, as we approached it in the trap, slapped the water sharply with its tail and endeavored to dive. That failing, he put up a most spirited resistance, and it was only after a sharp struggle that he was projected head first into a tied-up coat sleeve and in that fashion carried home. The two were put into a box, and given various green stuff, some of which they ate, but the second night they escaped. I heard them moving about in the night, mewing much like kittens, and gnawing the sides of the box, but they made their escape by forcing up the lid; and, as the river was but a few yards distant, they doubtless swam down the stream.

The beavers secured apparently represent at least three generations: the six very young ones, apparently but a few weeks old, three males and two females, fully adult, but probably not as large as they would eventually become, for the remaining specimen, an old female (no. 12107) is very much larger than any of the others. The accompanying table of measurements shows the differences, both in size and weight. This very large one, two of the medium sized animals, and two juvenals were all taken from the same house, and very possibly represent three generations of the same family.

The young ones, all about the same age, are about the size of musk rats. One caught on June 20 (no. 12105) measures: length 503, tail vertebrae 162, hind foot 93, ear 24; weight four pounds. They are covered with soft, thick fur, paler colored than the adults, about hazel above, and more grayish brown below.

We saw no beavers at Nootka Sound, but were told that there were many at Vernon Lake, some eight or ten miles inland from the head of the Tahsis Canal. The next place we encountered them was at the head of Central Lake, where there were a few, possibly only a single family, at the river mouth near our camp. No houses were seen, but one or two beavers were swimming about nearly every evening, and Despard finally captured one, an old male, on August 25 (no. 12111).

The Vancouver Island beavers differ from those from southeastern Alaska (*C. c. phaeus*, Heller, 1909, p. 250), principally in slightly paler coloration. The Alaska skins, though collected

at the same season of the year, are nevertheless in better pelage, with longer hair and thicker underfur. For the application of the name *leucodontus* to the Vancouver Island beaver see Osgood, 1907, p. 47.

External Measurements of *Castor c. leucodontus* from Vancouver Island

No.	Sex	Length	Tail	Hind foot	Ear	Weight in pounds
12101	♂	1000	340	175	31	38
12102	♂	932	350	173	31	28
12104	♂	900	280	165	22	22
12111	♂	990	395	175	30	....
12103	♀	925	350	170	25	28
12107	♀	1157	450	200	33	49½
12108	♀	967	400	170	38	25

Cranial Measurements of *Castor c. leucodontus*

No.	Sex	Basilar length of Hensel	Zygomatic width	Mastoid width	Interorbital width	Length of nasals	Width of nasals
12101	♂	112.0	95.0	.....	23.0	45.5	23.0
12102	♂	106.0	87.5	66.5	22.2	41.0	21.0
12104	♂	98.0	82.0	62.5	22.0	39.0	20.0
12111	♂	111.5	92.0	75.0	24.0	43.5	23.0
12103	♀	103.0	83.8	65.0	22.5	38.8	20.5
12107	♀	123.5	101.5	.....	25.0	55.5	24.5
12108	♀	101.0	88.0	67.5	25.0	38.0	21.0

Epimys norvegicus. (Erxleben)

Norway Rat

Probably occurs at all the seaports, as we encountered it far inland at several points. I was rather surprised to find Norway rats in considerable numbers in the vicinity of our camp at the head of the Tahsis Canal, where they had probably been carried from Friendly Cove. The distance is not great, about twenty-five miles, but all the travel up the canal is in small boats, and it is difficult to conceive how the rats escaped observation in transit. The several Indian houses at this point sheltered innumerable rats, but as the buildings are occupied but a brief portion of the year the animals must obtain other sustenance than the garbage and scraps they are most fond of. They were living in the woods in the immediate vicinity of the cabin in

which we were camped, and a number were caught in traps, many of them early in the evening, long before dark.

At Errington they were abundant in the grain fields, and I saw many of their burrows in the walls of the drainage ditches, but I was told that in the winter much of this land was flooded, or so saturated with water that the rats were all driven to higher ground.

Two specimens were preserved (nos. 12447, 12448), an adult male and female, collected at the Tahsis Canal, July 27.

Peromyscus maniculatus austerus (Baird)

Puget Sound White-footed Mouse

Very abundant almost everywhere; in fact, the majority of specimens secured were trapped in self-defense in and about our various camps. During the month spent at Beaver Creek three or four mice were caught every night in the tent where the provisions were kept. Most of those taken at Nootka Sound were trapped in the cabin, and at Central Lake twenty-three were caught in two nights in the cabin we occupied.

Two hundred and three specimens were preserved (nos. 12112–12309, 12597–12601), 198 as skins, and five in alcohol, from Vancouver, Nanaimo, Parksville, Little Qualicum River, French Creek, Errington, Alberni, Golden Eagle Basin, Tahsis Canal, and Friendly Cove.

The Nootka Sound specimens are appreciably larger than those from the east side of the island. Comparative measurements are as follows: average of nine adults from Tahsis Canal and Friendly Cove, length 191.8, tail 103.3, hind foot 22.6; average of nine adults from the vicinity of Parksville: length 167.4, tail 84.1, hind foot 20.6.

Evotomys caurinus Bailey

Northwestern Red-backed Mouse

An adult female of this species was trapped by Miss Alexander on the outskirts of the city of Vancouver, on the mainland of British Columbia, on April 22 (no. 12310). It measures as follows: length 136, tail 34, hind foot 18.

Microtus tetramerus (Rhoads)

Vancouver Island Meadow Mouse

A large series was collected at Beaver Creek, and a few at other points. None was secured, nor did we see runways or other signs of their presence at any of the points visited on the east side of the island. Some extensive grassy meadows at Beaver Creek harbored large numbers of the animals, but the runways were few and rather ill-defined, considering the extent to which they were used. A large proportion of the specimens collected here during June were young of various ages. Many of the females were pregnant, containing five, six or seven embryos. In the Golden Eagle Basin (altitude 2000 feet) the ground in many places showed traces of the old burrows which had been used under the snow during the previous winter, plugs of dirt and dry grass enabling one to trace their courses easily. There were many of these around the mine buildings, where the piles of lumber, wood and rubbish had evidently been used as shelters, but at the time of our visit the mice had all left this place, and none was caught about the houses. I found them in patches of grass and veratrum in the open basin, but there were almost no runways, and they did not appear to be abundant. A line of traps was set out for two nights near the summit of Mount Douglas, but no mice were secured, nor did I see any sign of their presence.

One specimen was taken at Friendly Cove, but they may be more abundant here than this would indicate, for we did comparatively little trapping at this point.

One hundred and forty-two specimens were preserved (nos. 12311–12446, 12591–12596), 136 skins and six in alcohol. Adults measure somewhat larger than the dimensions given by Bailey (1900, p. 47) of specimens from the vicinity of Victoria. Ten adults from Beaver Creek, five males and five females, average as follows: length 198.2 (185–205), tail 62.7 (59–64), hind foot 24.4 (24–25).

Felis oregonensis Rafinesque

Northwestern Puma

An abundant species, for an animal of this type, throughout

the wilder parts of Vancouver Island, and frequently seen near many of the smaller towns also. Everywhere we went we heard accounts of panthers seen nearby, but none was encountered by any member of our party. They are shy and secretive, of course, and in the dense growths of ferns and other underbrush that obscure everything during the summer months, are easily able to avoid observation.

A good specimen, skin and skull, of an adult male (no. 12449) shot in the vicinity of Parksville on April 24, was purchased from the man who killed it. In the Beaver Creek Valley, near Alberni, they are evidently abundant, as one farmer residing a few miles from where we camped had killed thirteen during the previous winter. He shot two more during the month we were there, but we were unable to obtain either of them from him. He had two good dogs, by which the panthers were all treed, and held at bay until the hunter arrived. The dogs were apparently very small for such work, one of them about the size of a fox terrier, and the other somewhat larger, and it seems curious that an animal the size of a panther should run from such small assailants, the more so as they have the reputation of preferring dog meat to almost anything else as a diet, and are said to carry dogs away from the ranches frequently. The panthers probably fear the man, who they realize is apt to be near at hand, more than they do the dogs, but it may be that the fearless and noisy onslaught of the latter is also not without its demoralizing effect on animals that prefer to hunt in the dark and in absolute quiet.

At Beaver Creek a panther got into a beaver trap one night, but broke the chain by which it was fastened and went off with the trap. Fresh sign was seen several times in the vicinity of the Golden Eagle Basin and on the China Creek road, between that point and Alberni. I saw several skins in the store at Friendly Cove and was told that many were killed about Nootka Sound during the winter months. I obtained four skulls here (nos. 12450–12453), two at Friendly Cove and two at the Tahsis Canal.

The specimen secured at Parksville was in good condition, and, according to the man who shot it, with a thick covering of

fat over the entire body. It measures as follows: total length, 6 feet 7 inches; tail 30 inches, hind foot 11 inches. Its appearance is as follows: General body color cinnamon rufous, becoming darker on the middle of the back (chestnut), and on the top of the head (hazel); chin, throat, median line of abdomen, and inner surface of thighs, rather abruptly pure white, interrupted on the breast, which is like the sides but somewhat duller; inner surface of fore legs more grayish. Face about the color of sides; black patches at the base of whiskers sharply defined and conspicuous; upper lips, between this marking and nostrils, pure white. A whitish area above the eye, and another below, the latter merging into the white of the throat; upper surface of ears very dark, almost black. Tail, the color of the back on the dorsal surface, duller below; abruptly black tipped, this mark extending about 90 mm. from the tip above, about 50 mm. below.

One of the skulls obtained at Friendly Cove (no. 12450), has the top of the head very much malformed, apparently as the result of an injury received years before. There is a deep groove extending diagonally from just behind the left post-orbital process to just above the right one, and this whole part of the skull is distorted and with portions of the bones missing. The three left upper incisors with the portion of the premaxillary in which they grew, are gone, and the edges of the bone smooth and rounded. It is difficult to see how the animal could have survived such injuries.

Another skull (no. 12452) was taken from the carcass of an animal killed by strychnine, and the whole frontal region is torn to shreds, the injuries having been done by the animal's own claws, in the agonies induced by the poison. The nasals are torn through nearly to the palate, and even the thick heavy bones above and surrounding the eyes are torn away or pierced through in a score of places.

There is not at hand material to indicate the relationship of the Vancouver Island puma to the animal occurring on the mainland farther south. A skull of a male from Mount Shasta, however, is not to be distinguished from those in the former series, and some female skulls from points still farther south in California are very similar to the single female from Nootka Sound.

Two skins from central California, one from Tulare, the other from El Dorado County, are decidedly different in color from the single Vancouver Island skin, being very much duller and without the reddish appearance of the latter.

CRANIAL MEASUREMENTS OF *Felis oregonensis* FROM VANCOUVER ISLAND

Number	Sex	Greatest length	Basilar length of Hensel	Zygomatic width	Interorbital constriction	Nasals	Width between tips of post-orbital processes	Occipito-nasal length	Height of skull; frontals above palatines	Occipito-sphenoidal length	Transverse diameter of bullae	Under jaw; anterior symphesis to posterior condyle	Greatest length of left upper carnassial	Greatest diameter of left upper carnassial
12449	♂	213.0	171.5	138.0	39.2	45.0	69	188.0	81.0	64.0	20.0	140	23.0	12.2
12450	....	224.0	.....	154.0	46.0	46.5	91	196.5	86.5	.....	.....	146	23.5	12.0
12452	♂	210.0	172.0	146.5	.....	.....	....	187.0	79.0	64.5	21.0	143	23.5	12.0
12453	....	221.0	.....	158.0	49.2	46.0	86	199.0	87.0	.....	22.0	150	24.0	13.0
12451	♀	172.5	145.5	119.5	36.0	39.0	63	156.0	72.0	54.2	19.2	117	20.5	11.0

Canis occidentalis Richardson

Gray Wolf

Wolves are quite abundant in the wilder parts of at least the northern two-thirds of Vancouver Island, sufficiently so to be a serious menace to the deer in many places. While at Parksville Miss Alexander was presented with the skull of a wolf killed near by, on Englishman's River, some time before. At Beaver Creek one was heard howling one night, and I was told that they were occasionally seen in the valley during the winter, but very seldom in summer. At Nootka they were said to be abundant. On the Tahsis Canal we stayed at the camp of a trapper who made it his principal occupation during the winter to hunt wolves and panthers, and who evidently secured enough to make it pay. The Provincial government pays a bounty of fifteen dollars a head on these two species, and this added to the value of the fur makes it, if not a very lucrative pursuit, at least sufficiently so to induce some men to devote considerable of their time to it. This man used poison exclusively, and seemed to have no trouble in killing the animals. In several years hunting he had seen but two or three alive, for they are extremely cunning in keeping out of sight.

I secured three skulls from him, of animals killed during the

previous winter, picking these up in the woods at the points where he had killed and skinned them. Of two he was able to tell me the sex. I also purchased from Mr. Smith, at Friendly Cove, the skin of a wolf brought in by the Indians during the previous winter, and killed somewhere in the immediate vicinity. At this point wolves had been so abundant for some years past that the deer had been almost completely driven out. During the two weeks of our stay here we saw fresh deer tracks on only one or two occasions. No live deer were seen by either of us, but the Indians killed one on an island nearby, where another was seen.

At Great Central Lake, on the night of August 23, a wolf was heard howling nearly all night.

The skin secured at Nootka (no. 13005) was evidently of a large specimen; the tanned skin measures 1850 mm. in length. The general appearance is of a gray animal, lighter on the sides and legs, and darker on the head, back and tail. Head, muzzle, and ears dark "pepper-and-salt." Hairs on neck, back and upper surface of the tail, yellowish-white basally, and black tipped for about the terminal third of their length. A small proportion of the hairs on the back, and a great many of those on the sides of the neck, are entirely white; those at the tip of the tail, black almost their entire length, so that the tail appears decidedly black-tipped. Sides, belly and legs abruptly paler, yellowish white. Inner surface of legs almost pure white. There is a narrow, dusky streak on the front of each fore leg. The hind legs are immaculate. Hair between the toes chestnut. The body is everywhere covered with thick gray under fur. The long hairs of the neck and back are from three to four inches in length.

Cranial Measurements of *Canis occidentalis* from Vancouver Island

Number	Sex	Total length	Basilar length of Hensel	Zygomatic width	Width across post-orbital processes	Median length of nasals	Palatal length	Length of upper tooth row	Length of cuirine	Length of lower jaw	Height at coronoid process
12454	....	249	216	134.0	....	91.8	118.0	102.0	30.0	187.0	70.0
12455	♂	248	211	128.0	62	88.2	121.5	104.5	31.0	182.0	63.2
12456	♂	259	221	142.0	71	88.2	125.0	105.8	32.2	192.5	70.5
12457	....	257	220	143.5	72	87.8	122.0	106.0	29.0	190.0	68.0

Lutra canadensis periclyzomae Elliot

Island Otter

One was trapped by Despard near Parksville the last week in April (no. 12475). This specimen, an adult female, measures as follows: length, 1219; tail, 495; hind foot, 127; weight, twenty-four pounds. The skull is not to be distinguished from specimens from southeastern Alaska, but in color the skin is appreciably darker than any of our specimens from the latter locality. The general color of the upper surface is very dark brown, between seal brown and clove brown; below it is about Prout brown.

The species is probably of general distribution over the island, though we did not meet with it elsewhere. I saw a skin at Friendly Cove that had been procured somewhere in the vicinity.

Gulo luscus (Linnaeus)

Wolverine

There are a few wolverines on the higher mountains of Vancouver Island, but they are rare, and but very seldom trapped. Despard saw the tracks of what appeared to be this species near the summit of Mount Saunders, on July 2, and I was told of one or two that had been killed in the mountains near Alberni in years past. Mr. Smith, the storekeeper at Friendly Cove, told me that the Indians usually brought in one or two every year, and promised to save me the next one he received. In accordance with this promise he later shipped to the Museum the skin of a wolverine caught by an Indian somewhere in the immediate vicinity of Nootka Sound, during the winter of 1910–11 (no. 13006). Unfortunately he was unable to get the skull for us.

This animal is extremely dark colored as compared with two skins at hand from the Alaska Peninsula. These latter (the only additional ones available) are summer specimens, however. The Nootka wolverine is colored as follows: Forehead and muzzle very dark brown, almost black. Top of head, from between the eyes, abruptly paler, more grayish. Dorsal stripe from neck to rump glossy black. Lateral stripes, meeting on rump, grayish over the shoulders, and becoming more yellowish posteriorly at

the base of the tail. Terminal half of tail black. Legs and feet glossy black. Under surface of body dull black; throat, breast, and sides of neck extensively but irregularly blotched and streaked with white, the neck blotches strongly suffused with ochraceous buff.

The fur is very much finer and softer than that of the two Alaskan skins mentioned above, to an extent that does not seem entirely due to the different seasons at which they were collected.

Lutreola vison energumenos (Bangs)

Pacific Mink

Six specimens (nos. 12476–12481), all males, collected during May and June, two at French Creek, three on the Little Qualicum River, and one at Beaver Creek. Besides these I picked up a skull on the beach at Nootka Sound (no. 12605).

These skins, compared with mink from southeastern Alaska (*L. nesolestes*) taken at the same season of the year, are appreciably paler and more reddish. The general body color is vandyke brown, darker on top of the head, the median line of the back, and the tip of the tail. The under fur is paler, about wood brown. On each specimen there are disconnected and somewhat variable patches of white on the chin, throat, breast and abdomen.

The specimens collected measure as follows:

External Measurements of *Lutreola v. energumenos*

No.	Sex	Length	Tail	Hind foot	Weight
12476	♂	630	213	77	4 lbs. 1 oz.
12477	♂	559	166	64	2 lbs. 1 oz.
12478	♂	557	183	70	.....
12479	♂	596	190	80	.....
12480	♂	640	200	82	.....
12481	♂	563	161	70	.....

Putorius streatori Merriam

Puget Sound Weasel

The dessicated carcass of a small weasel was picked up at French Creek, May 1 (no. 12482). It is in summer pelage, brown above and white below, but too weather-beaten to afford an exact

criterion of the color characters of the species. I saw a weasel at Friendly Cove, but was unable to secure it. As I was skinning birds in our cabin in the late afternoon of August 8 he suddenly appeared on the doorstep and stood there for a few moments, but at my first movement he disappeared and was not seen again. Frequently at night I heard the mice scurrying about over the floor, as though something was after them, so in all probability he used the house regularly as a hunting ground.

Mustela caurina C. H. Merriam

Pacific Marten

Apparently fairly common in the higher mountains, but in summer at least not found in the valleys and lowlands. Four specimens, all males, were secured by Despard (nos. 12471–12474), one near Errington, May 25, and three in the Golden Eagle and King Solomon basins, taken on July 6, 16, and 20, respectively. At least one other marten pulled loose from the trap and escaped at the latter locality, and one was seen in the woods by Despard on July 3. He remarked that in his many years of trapping it was only the second or third he had ever seen at large in the woods.

Two females were subsequently trapped by him in the hills near Errington on January 10 and 21, 1911, and acquired by the Museum (nos. 13002, 13003).

The six specimens thus obtained are referable to the species *caurina*, judging from the published description (Merriam, 1890, pp. 27–29). The four males are in summer pelage, and consequently short-haired and with scanty under fur. In general appearance they are uniform dull brown (about Prout brown), darkening somewhat on rump, feet, and tail, where the long, dark-colored hairs more effectually hide the yellowish-brown under fur. The tip of the tail, of conspicuously longer hairs, is black. The inner surface of the ear is very slightly grayish. On the throat there is an irregular patch of pale orange-rufous, disconnected spots of the same interspersed with a few white hairs, extending onto the breast.

The two winter skins are much more richly colored. They,

too, are uniform brown, with no trace of gray on the head, but the pelage is darker and much more glossy than the summer specimens. Long outer hairs dark brown, about mummy brown; under fur paler, about raw umber; tail black. There are numerous white hairs scattered over the entire skin. The throat patch is of about the same color as in the summer skins.

There are at hand, of interest in this connection, two specimens of *Mustela* from southeastern Alaska, recently donated to the Museum by Mr. Allen E. Hasselborg, of Juneau, Alaska. These are an adult female, skin and skull, taken on Admiralty Island, Alaska, December 12, 1910 (no. 12674), and an adult male, skull only, also from Admiralty Island, December 15, 1910 (no. 12675). These, together with a skull from Kuiu Island, Alaska (no. 8814), I have provisionally referred to *M. nesophila* (see Swarth, 1911a, p. 139).

These three skulls are much like those from Vancouver Island, but somewhat larger, with smaller and less inflated audital bullae, and with appreciably larger last upper molar, thus closely resembling the description and figure of *M. nesophila* (Osgood, 1901, p. 33, pl. 5). The one skin from Admiralty Island is quite different from any of the Vancouver Island specimens. It is of about the same shade of brown, but the whole body, except along the median line of the back, is strongly suffused with orange-red (somewhat darker than Chinese orange), giving a very rich effect —a character, however, that, according to Merriam (1890, p. 27), is sometimes present in *caurina*. Feet, legs, and tail, are lustrous black. The head is abruptly grayish, drab on the chin and lower jaw, broccoli brown, mixed with white hairs, above; tip of muzzle darker; inner surface of ears white. A large spot of orange-rufous on the throat and breast.

Nesophila was based on cranial characters only, no skins having been seen by the describer, but, taking this Alaska specimen as a representative of the species, it may be readily distinguished from the more southern form (*caurina*) by its gray head, and from the more northern one (*americana*) by its intensely dark coloration otherwise.

External Measurements of *Mustela caurina* from Vancouver Island

No.	Sex	Length	Tail	Hind foot	Ear
12471	♂	602	190	90	....
12472	♂	638	195	90	38
12473	♂	610	200	100	40
12474	♂	590	200	90	40
13002	♀	590	190	100	30
13003	♀	585	180	100	30

External Measurements of *Mustela nesophila* from Admiralty Island, Alaska

12674	♀	565	185	90	....

Cranial Measurements of *Mustela caurina* from Vancouver Island

No.	Sex	Basilar length of Hensel	Palatal length	Post-palatal length	Zygomatic width	Width across post-orbital processes	Least post-orbital breadth
12471	♂	72.5	38.8	33.7	51.0	25.5	16.0
12472	♂	75.5	41.0	34.5	53.0	26.0	15.5
12474	♂	69.5	38.0	31.5	50.0	24.0	17.0
13002	♀	65.0	34.2	30.8	44.2	22.5	16.0
13003	♀	66.2	34.2	32.0	43.5	24.0	15.0

Cranial Measurements of *Mustela nesophila* from Southeastern Alaska

8814	....	75.0	42.0	33.0	51.5	26.0	17.2
12674	♀	68.5	36.0	32.5	47.0	23.0	16.2
12675	♂	76.0	41.2	34.8	50.0	24.8	18.0

Ursus americanus americanus Pallas

Black Bear

We found bears in some numbers in the mountains south of Alberni, and saw abundant sign of their recent presence at nearly every other place visited. Eight specimens were preserved (nos. 12458–12464), as follows: an adult male, Errington, June 20, 1909, shot by Despard and presented to the Museum, skin of the head, with skull; male, Englishman's River, May 9, skin and skull; female, King Solomon's Basin, July 12, skin only; female, Mount Douglas, July 14, skin and complete skeleton; male, King Solomon's Basin, July 15, skin and complete skeleton; and two skulls, one from Mount Douglas, July 15, and the other from Nootka Sound, July 25.

In the vicinity of the Golden Eagle Basin, during the three weeks spent at this point, we saw between us probably eleven or twelve bears. They were met with at all times of the day, several being encountered about noon, when the sun was beating down with intense heat. July 14 to 17 we spent on Douglas Mountain, and several were seen each day. On the 14th, while crossing King Solomon's Basin, about nine in the morning, a bear was seen leisurely picking his way up a rocky gulch across the cañon, but it was too far to risk a shot and he disappeared in the brush without becoming aware of our presence. Later in the day, on the summit, a bear swam across a corner of the little lake by which we were encamped, and waded out on the mossy bank, where he stood not more than twenty-five yards distant. It made a beautiful picture, the black animal, with the drops of water sparkling in the sunshine on his shaggy coat, standing on the green moss, partly out of the water, with a background of snow banks on the farther margin of the lake. He quite evidently had not scented us at all, though we had a fire burning, but almost at once he caught sight of our black dog who sat quietly regarding him with placid curiosity. The two stared at each other, while we sat unseen in the shadow of the trees, but Despard reached for his rifle and fired without without awaiting any further developments. The bear disappeared in the brush with a crash, but went only a few yards before it dropped dead. The same evening another was seen from the ridge leading up to Mount Douglas, feeding in the bottom of the cañon far below..

On July 17, on our return trip, one was secured in King Solomon's Basin. We were picking our way, heavily laden, along the edge of a snow slide, when the tall grass on the side was violently agitated by some animal coming toward us, only about thirty yards distant, but entirely hidden by the vegetation. We stood still and waited, and almost at once a black head was poked up, sniffing suspiciously in all directions. Despard fired and the head disappeared, but although everything was quiet, it was some time before we ventured into the grass to investigate. Then we sent the dog on ahead to reconnoiter, and as nothing happened to him, followed, with caution. However, the bear was quite dead, with a broken neck, and had not moved out of his tracks. This

was at noon, in the hot sunshine, and it was the third we had seen in three days feeding in the middle of the day.

The three secured here all had their stomachs filled with grass. The vegetation was just coming up at this altitude, where the spring growth was much later than in the lowlands, and there were quantities of rank, green grass everywhere.

These bears are in remarkably fine pelage, considering the season, being almost like winter skins. The outer hair is from four to five inches long, over the entire animal, and there is fairly thick under fur. Despard informed me that the lowland animals were at this season thin-haired and of shabby appearance, and that their skins had no commercial value. The differences in environment seem to be the cause of the variation, for though the weather was exceedingly hot in the lowlands at this season, at the altitude where these bears were collected the snow still lay deep on the ground, and much of it would probably remain throughout the year.

On August 17 I saw one on the shore of Great Central Lake; on the following day another was observed near the head of the lake.

The skins obtained, and others seen, were all black, and I was told that the brown phase was unknown on the island.

Although I have provisionally referred these bears to *Ursus americanus americanus*, which they seem to resemble more nearly than they do the various western subspecies, judging from published descriptions, it is possible that comparison with material from eastern North America would show that they are a distinct form; especially so as an apparently well-marked race occurs in the intervening area on the adjacent mainland. The Vancouver Island bear is not at all like *U. a. altifrontalis* (Elliot, 1903, p. 234) from Washington, which it might be expected to resemble. The skulls at hand have not the tall, rounded forehead of that form, but in their superior outline closely resemble specimens from the Alaskan mainland (Yakutat Bay and Kenai Peninsula). They differ from these constantly in greater proportional width (zygomatic width) and in larger size of the teeth. In the latter characters they approach the southeastern Alaska island form *pugnax*, differing from that again in the same degree as they resemble the Yakutat Bay and Kenai Peninsula specimens.

The combination of characters presented by the Vancouver Island bear appears to be: invariably black coloration, somewhat rounded skull, with proportionally wide spreading zygomata, and very large teeth.

The specimens secured measure as follows:

External Measurements of *Ursus americanus americanus*

No.	Sex	Length	Hind foot	Ear
12461	♂	1540	252	107
12464	♂	1880	254	110
12459	♀	1250	220	104
12460	♀	1380	232	137

Cranial Measurements of *Ursus americanus americanus*

Number	Sex	Basilar length of Hensel	Palatal length	Post-palatal length	Zygomatic breadth	Width across post-orbital processes	Length of nasals	Posterior edge of alveolus of canine to posterior edge of alveolus of last upper molar	Crown of last upper molar	Ratio % of zygomatic breadth to basilar length
12458	♂	.....	141	.....	185.0	101.0	67.5	80.0	26.5	.....
12461	♂	248	139	109	182.5	102.0	68.0	80.2	26.5	73.5
12463	♂	260	144	116	193.0	109.2	68.5	81.2	28.2	74.2
12464	♂	247	135	112	.....	92.0	70.0	78.0	27.8	.....
12460	♀	220	121	99	141.0	81.5	64.0	73.0	24.8	64.1
12462	...	225	124	101	146.0	78.2	60.5	72.0	27.0	64.9

Procyon psora pacifica C. H. Merriam

Pacific Racoon

Probably of fairly common occurrence in suitable places over the entire island. We secured six specimens (nos. 12465–12470), at Parksville, Little Qualicum River, French Creek, Errington, and Beaver Creek. At Friendly Cove I saw three young ones in the possession of Mr. Smith, the storekeeper, who had just got them from the Indians and intended to keep them as pets.

One was killed at Errington on September 12 while making a raid on the poultry yard at the ranch where we were staying. The intervention of the dog drove the raccoon up a tree, where it was easily secured.

These racoons are very dark colored, though not appreciably more so than specimens from the northwest coast of California.

The dark tail rings are very broad and black, and the tail is extensively black-tipped.

Sorex vancouverensis C. H. Merriam

Vancouver Island Shrew

Found in abundance at nearly every point visited. We collected in all 105 specimens on Vancouver Island (nos. 12485–12587, 12602–12604), from Parksville, Little Qualicum River, French Creek, Errington, Beaver Creek, and the Golden Eagle Basin. The only places where trapping was carried on, and where we failed to find shrews, was on Douglas Mountain and at Nootka Sound. At the former locality we secured nothing in the traps, and at Nootka the small mammal trapping was somewhat neglected in favor of bird collecting.

Two species of shrews are supposed to occur on Vancouver Island, *Sorex vancouverensis* and *S. obscurus* (Merriam, 1895, pp. 70, 72), but I am unable to distinguish more than one form in the material we collected. Two specimens were trapped on the mainland, in Stanley Park, Vancouver (nos. 12483, 12484) which, for geographical reasons, should belong to the subspecies *S. obscurus longicauda* (see Merriam, *l.c.*, p. 74), but although they are larger than any of the individuals composing the island series, they do not differ from them in color or proportions. They measure respectively: length, 120, 117; tail, 52, 52; hind foot, 13, 14. The average and extreme measurements of ten males from Vancouver Island are as follows: length, 106.9 (104–112); tail, 46 (41–52); hind foot, 13 (12–15).

Myotis lucifugus alascensis Miller

Alaska Brown Bat

A brown bat taken at Errington, August 31 (no. 12588), I have provisionally referred to this form. The specimen is so imperfect as not to admit of exact identification.

Small bats (apparently some species of *Myotis*) were fairly common at several points. At Beaver Creek I saw but few, and the days being very long then, it was not dark enough for bats to appear until nearly ten o'clock, so there was little chance to

secure them. One was seen at Friendly Cove, the evening of July 23.

At the head of Great Central Lake, August 17 to 25, bats were irregularly abundant, sometimes six to eight suddenly appearing at once, skimming over the surface of the water, to disappear again as quickly as they came. They were quite numerous at Errington, throughout September, but seldom came out until late in the evening, and remained in the woods where it was almost impossible to shoot them. The one secured was shot at such close range as to be badly mutilated.

Eptesicus fuscus (Beauvois)

Brown Bat

Two specimens taken at Errington (nos. 12589, 12590) on August 30 and September 25, respectively. The species was fairly common here, but was not positively identified at any other point.

The two collected are darker colored than most examples from southern California, but are exactly like specimens at hand from Humboldt County. The dorsal surface is Vandyke brown, the under surface wood brown.

GENERAL REMARKS ON DISTRIBUTION

Though the one season's work is not sufficient to supply data for the accurate definition of the life-zones of Vancouver Island, it is in general confirmatory of the division indicated on the zone map in the 1910 edition of the A. O. U. *Check-List*. That is, that the extreme southern tip of the island, and a narrow strip on the east coast, south of the center, is Transition Zone; the remainder, by far the greater part of the island, Canadian, with the exception of the limited area of Hudsonian and Alpine-Arctic on the mountain tops. The following generalizations, and the accompanying lists are tentative, to the last degree, and will probably require extensive revision with additional work in the region. They represent conditions as noted during brief visits at various points during a single season, and as such may serve for comparison with further observations.

The following species of birds were found by us on the east coast only, in the vicinity of Parksville and Nanaimo. They are characteristic of the Transition and Upper Sonoran zones, elsewhere, and find here their northern limit on the Pacific Coast.

Dryobates p. gairdneri	Spizella p. arizonae
Agelaius ph. caurinus	Progne s. hesperia
Carpodacus p. californicus	Lanivireo s. cassini
Zonotrichia l. nuttalli	Thryomanes b. calophonus

Vireo huttoni obscurus also occurs at the southern extremity of the island, but was not encountered by our party.

A number of other Transition and Sonoran Zone species found on the east coast, extend across the divide of the island and find their northern and western limit in Alberni Valley. Some of the more conspicuous of these are:

Rallus virginianus	Stelgidopteryx serripennis
Cathartes a. septentrionalis	Vireosylva g. swainsoni
Sturnella neglecta	Dendroica a. auduboni
Euphagus cyanocephalus	Troglodytes a. parkmani
Pipilo m. oregonus	Sialia m. occidentalis
Zamelodia melanocephala	

The species which we found breeding on the west coast only (Canadian Zone) are as follows:

Sphyrapicus v. ruber	Dendroica townsendi
Empidonax difficilis	Nannus h. pacificus
Empidonax hammondi	Hylocichla g. nanus
Passerella i. fuliginosa	Ixoreus n. naevius

There were two species encountered in a manner possibly indicative of a distinguishable belt of Hudsonian Zone:

Perisoreus o. obscurus	Pinicola e. flammula

One Alpine-Arctic species of bird was met with:

Lagopus l. leucurus

The long list of birds of general distribution over Vancouver Island during the breeding season includes the following species, of particular abundance:

Bonasa u. sabini	Colaptes c. saturatior
Dendragapus o. fuliginosus	Cypseloides n. borealis
Columba fasciata	Selasphorus rufus
Ceryle a. caurina	Nuttallornis borealis
Dryobates v. harrisi	Empidonax t. trailli

Cyanocitta s. stelleri
Corvus b. caurinus
Loxia c. minor
Spinus pinus
Junco o. oreganus
Melospiza m. rufina
Bombycilla cedrorum
Vermivora c. lutescens
Dendroica ae. rubiginosa
Oporornis tolmiei
Wilsonia p. pileolata
Cinclus m. unicolor
Penthestes r. rufescens
Hylocichla u. ustulata
Planesticus m. caurinus

These are all wide ranging species, many of them occurring from southern California to Alaska, and most of them are not distinctive of any one zone.

Of the mammals, the following appear to be distributed over the length of the island, both in the Canadian and Transition zones, but usually at low altitudes, in the valleys and along streams.

Sciurus h. vancouverensis
Castor c. leucodontus
Peromyscus m. austerus
Microtus tetramerus
Lutra c. periclyzomae
Lutreola v. energumenos
Putorius streatori
Procyon ps. pacifica
Sorex vancouverensis
Myotis (three species)
Eptesicus fuscus

The following four species are of general distribution, in all zones and at all altitudes; they are all great wanderers:

Odocoileus columbianus
Felis oregonensis
Ursus americanus
Canis occidentalis

Three species are apparently restricted to high altitudes:

Marmota vancouverensis
Gulo luscus
Mustela caurina

Two conspicuous trees, very noticeable on the southeastern coast, are lost sight of on the west side of the island—the Garry oak (*Quercus garryana*) and the madroña (*Arbutus menziesii*). The former occurs in abundance about Victoria, and I saw trees as far north as Beaver Creek (near Parksville). The madroña is common along the stage road between Nanaimo and Parksville, and for some distance north of the latter point, but stops rather abruptly near the east end of Cameron Lake. I saw none in Beaver Creek Valley, nor in the immediate vicinity of Alberni, and was consequently rather surprised at encountering a few trees scattered along the north shore of Great Central Lake.

To sum up: There seems to be a well-defined area of Transition Zone at the southern extremity of Vancouver Island, extending up the east coast at least to a point ten miles north of Parksville, probably some distance farther. The great bulk of the island elsewhere is Canadian, except that in Alberni Valley, on the west coast, there is a decided infusion of Transition species. The presence of the wolverine, marmot, marten, pine grosbeak, and Oregon jay, at the altitudes where we found them, is perhaps indicative of a recognizable, though restricted, timberline belt of Hudsonian Zone. The ptarmigan is apparently the only species restricted to the Alpine-Arctic mountain tops, though the pipit also may be found to breed there.

Vancouver Island is but slightly separated from the mainland and has but few species peculiar to it. There are no birds of this class, but the following mammals are not known to occur elsewhere: *Microtus tetramerus*, *Marmota vancouverensis*, and *Sorex vancouverensis*. The marmot, singularly isolated in the center of the island, is a strongly marked species. The shrew and meadow mouse are not so widely different from allied mainland species. *Peromyscus maniculatus austerus* ranges unchanged on the island and on the adjacent mainland, though singularly enough there are two distinct subspecies known from Saturna and San Juan islands in the separating channel (see Osgood, 1909, pp. 61, 62). In view of the presence of such genera as *Marmota*, *Gulo*, *Mustela*, and *Felis*, the non-occurrence of *Erethizon*, *Lynx*, and *Evotomys*, as well as several others from the nearby mainland, seems rather remarkable. The presence of the elk on Vancouver is also of interest.

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[Note: The author is indebted to Dr. C. W. Richmond for the citations of Linné's "Systema Naturae," and Latham's "General Synopsis" and "Supplement."]

EXPLANATION OF PLATES

PLATE 1

Map of the portion of Vancouver Island traversed by the expedition. Dotted line shows the route followed; crosses indicate collecting stations.

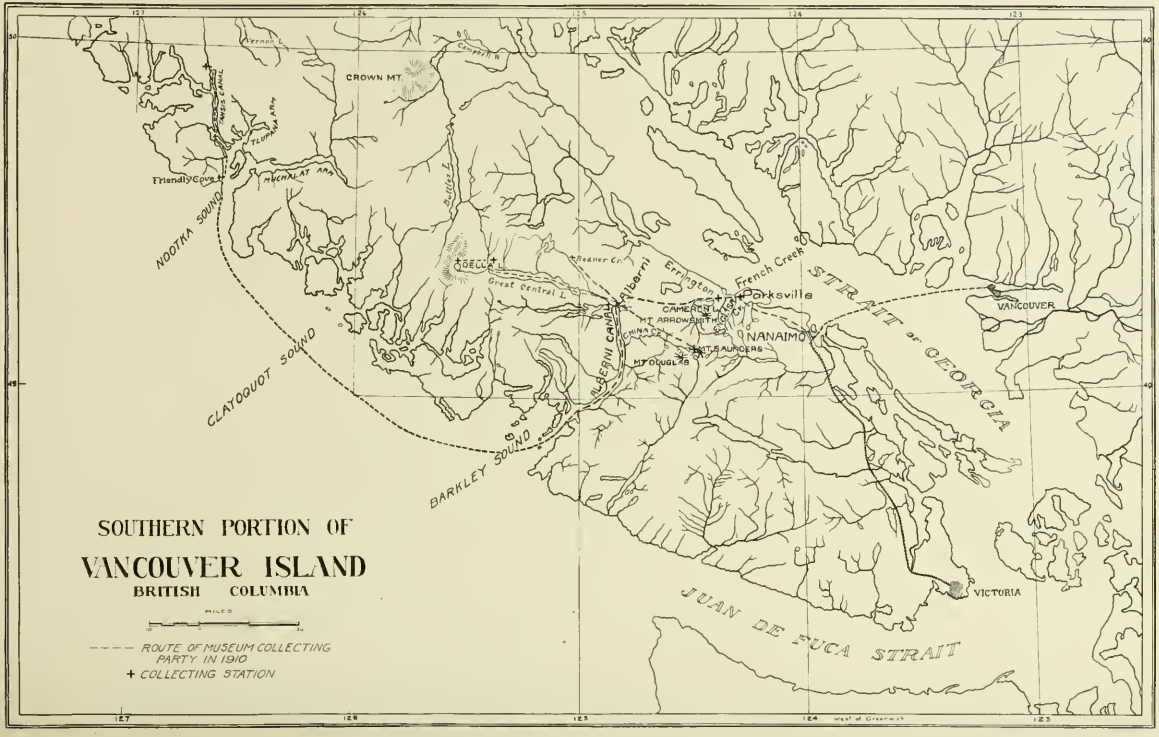
CROWN MT.
Friendly Cove
NOOTKA SOUND
KYUQUOT SOUND
CLAYOQUOT SOUND
BARKLEY SOUND
Great Central L.
ALBERNI CANAL
Alberni
Errington
French Creek
Parksville
CAMERON L.
MT. ARROWSMITH
NANAIMO
MT. SAUNDERS
MT. OUGLAS
STRAIT OF GEORGIA
VANCOUVER
VICTORIA
JUAN DE FUCA STRAIT
SOUTHERN PORTION OF
VANCOUVER ISLAND
BRITISH COLUMBIA
MILES
ROUTE OF MUSEUM COLLECTING PARTY IN 1910
+ COLLECTING STATION

PLATE 2

Mount Saunders, altitude 5500 feet; July 5, 1910. Showing Hudsonian and Alpine-Arctic zones; the habitat of *Marmota vancouverensis*, *Mustela caurina*, *Lagopus leucurus*, and *Passerella i. fuliginosa*.

PLATE 3

Beaver house. Beaver Creek Valley; June 22, 1910. Built over a log, in shallow water. Though beavers were numerous in the valley they were not congregated in numbers in any one place. Single houses were scattered at wide intervals along the smaller streams, so hidden by the surrounding vegetation as to be difficult to see.

PLATE 4

Indian deadfall trap. The type generally used by the coast Indians of British Columbia and southern Alaska, for the capture of the smaller fur bearers, such as marten, mink, and weasels. Head of Tahsis Canal, Nootka Sound; July 31, 1910.

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A NEW CONY FROM THE VICINITY OF MOUNT WHITNEY

BY

JOSEPH GRINNELL

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Vol. 10, No. 2, pp. 125-129 January 31, 1912

A NEW CONY FROM THE VICINITY OF MOUNT WHITNEY

BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

The expedition of the Museum to the Mount Whitney region of California in the summer of 1911 produced, among other things of special interest, a small series of a species of cony. During the summer of the previous year field work by Annie M. Alexander and Louise Kellogg in the central Sierra Nevada provided a practically topotypic series of the *Lagomys* (= *Ochotona*) *schisticeps* of C. H. Merriam (1889, p. 11). It is thus possible to make direct comparison of the Mount Whitney material with specimens in corresponding seasonal pelage from the type locality of the most nearly situated species. The results of such comparison show the southern animal to be a well marked new form.

Ochotona albatus, new species

Mount Whitney Cony

TYPE: Female adult; no. 16223, Mus. Vert. Zool.; near Cottonwood Lakes, 11,000 feet, Sierra Nevada Mountains, Inyo County, California; September 3, 1911; collected by J. Grinnell; orig. no. 1741.

DIAGNOSTIC FEATURES: Differs from *Ochotona schisticeps*, of the central Sierra Nevada, in larger ears and much paler coloration throughout, creamy whitish above instead of brown and slate.

DESCRIPTION OF TYPE: General coloration, all over dorsal

surface, hoary white, with a tinge of cream-color on the head and back. There are faint dusky tippings to the new hairs on the anterior parts, but otherwise the continuity of paleness is only interrupted by the dark under-fur where it shows through. This under-fur is nearly slate-gray of Ridgway's *Nomenclature of Colors* (1886), and not the blackish slate as in *schisticeps*. The type-specimen of *albatus* is in process of molt, with a conspicuous V-shaped molt-line showing across the back behind the shoulders. The hair behind this molt-line is much shorter, with a scorched appearance, evidently due to wear. In front of the line, the new hair is longer, in color clearer white, grizzled by the dusky tippings. The large ears are much paler colored than in *schisticeps*, due in part to the sepia, instead of black, "ground color," and to the intermixture of very many more white hairs. Beneath, the type-specimen of *albatus* is whitish, with a creamy suffusion mid-ventrally and between the fore legs; there is also an irregular patch on the throat of a raw umber tinge. The color above, below, and laterally is very nearly uniform. The front feet are white above and below, the hind feet white above, and hair-brown on the soles, instead of blackish sepia as in *schisticeps*. The naked balls of the toes of both front and hind feet in the dried skin are slate-gray in *albatus*, instead of black as in *schisticeps*.

General Remarks: The conspicuous peculiarity of *albatus* is the entire lack of buffy or fulvous tints both above and below, this rendering the conies of Mount Whitney unique among all other North American species of *Ochotona*. The general peculiarities of the type as described above are shared, with scarcely any variation, by the other six examples in our collection from the Mount Whitney region. These specimens are listed in the accompanying table, together with the collector's measurements. The only appreciable difference in size between *albatus* and *schisticeps* is found in measurements of the orbicular ears, the southern series offering to the eye in mass effect a marked superiority in this respect, much more than might be indicated by the single measurement of the pinna given in the table. Judging from descriptions, *albatus* appears to have no close relationships with *O. cinnamomea* (Allen, 1905, p. 121), from the Beaver

Range, Utah, or with *O. saxatilis* (Bangs, 1899, p. 41), from the Snowy Range, Colorado, the two species named being the southernmost forms previously described.

As far as it goes, the cranial material at hand discloses no significant variations. Unfortunately nearly all the skulls in the series of both *schisticeps* and *albatus* were badly shattered by shot.

Distribution: Specimens representing *albatus* are at hand only from the localities listed in the table of measurements. In our field work in the vicinity of Mount Whitney we found plentiful evidence of the presence of conies close to timber-line, from the immediate slopes of Mount Whitney south to Cottonwood Pass. None were seen above 12,000 feet altitude nor below 10,600, except at one point on the Inyo side of the mountains near Little Cottonwood Creek, where unmistakable sign was seen and the characteristic bleat of the animals heard at about 9500 feet. In all this area the conies lived in the interstices of loose piles of huge granite rocks, especially as left in moraines by former glaciers. In such retreats the animals could often be heard, when it proved impossible to catch sight of them. Two specimens were trapped in "Out-o'-Sight" rat-traps baited with rolled oats and set for wood rats. There is no evidence, however, that the conies were attracted by the bait. The rest were shot by dint of much stalking. Usually only the head of the animal would be exposed and then only momentarily. This resulted in snap shooting with heavy charges of shot at long range, a very unsatisfactory method of capture, for the skulls were invariably badly damaged.

The rodent here described adds another name to the list of alpine mammals having distinct, though not distantly related representatives both in the Mount Whitney region and in the central and northern Sierra Nevada. Attention is called to *Thomomys*, *Microtus*, and *Eutamias* as genera affording examples of this. The faunal distinctness of the Mount Whitney region of the southern Sierra Nevada may in part be due to its much more arid climate, and in part to its long existence as a land mass of high elevation.

List and Measurements of *Ochotona albatus* from the Southern Sierra Nevada in the Vicinity of Mount Whitney

Mus. no.	Sex	Locality	Date 1911	Length	Tail vertebrae	Hind foot	Ear from inner base	Collector
16217	♀	Whitney Creek, 10,800 feet	Aug. 25	187	15	31	26	W. P. Taylor
16219	♀	Whitney Creek, 10,800 feet	Aug. 27	170	11	31	21.5	W. P. Taylor
16220	♀	Cottonwood Lakes, 11,000 feet	Sept. 2	176	4	29	25	H. A. Carr
16221	♂	Cottonwood Lakes, 11,000 feet	Sept. 2	179	5	30	28	H. A. Carr
16222	♂	Cottonwood Lakes, 11,000 feet	Sept. 3	176	6	29.5	28	H. A. Carr
16223	♀	Cottonwood Lakes, 11,000 feet	Sept. 3	183	15	29	28	J. Grinnell
16218	♂	Cottonwood Lakes, 11,000 feet	Sept. 3	180	10	29	29	W. P. Taylor

Transmitted January 15, 1912.

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THE MOLE OF SOUTHERN CALIFORNIA

BY

J. GRINNELL AND H. S. SWARTH

MYOTIS ORINOMUS ELLIOT, A BAT NEW TO CALIFORNIA

BY

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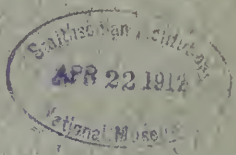

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Vol. 10, No. 3, pp. 131-136, 2 text-figures April 13, 1912

THE MOLE OF SOUTHERN CALIFORNIA

BY

J. GRINNELL AND H. S. SWARTH

(Contribution from the Museum of Vertebrate Zoology of the University of California)

As far as is known the family Talpidae has but a single representative in California south of the 35th parallel. This species, a member of the genus *Scapanus*, is plentiful locally, both in the lowland districts and on the mountains, reaching an altitude of 9000 feet in both the San Bernardino and San Jacinto ranges. The capture of specimens, however, is not an easy matter, though surface ridges marking the tunnels of the animals are conspicuous indications of their presence, especially soon after rains. In fact, repeated attempts to catch moles by various means have often failed altogether, even where signs were numerous. As a consequence of this difficulty in securing specimens, material representing the form found in southern California is still scant, but enough has accumulated to warrant our present systematic treatment. Our efforts in identifying the Museum collections from the San Jacinto region have led to the recognition of the following new form.

Scapanus latimanus occultus, new subspecies

Southern California Mole

TYPE: Female, young adult; no. 2369, Mus. Vert. Zool.; Santa Ana Cañon at 400 feet altitude, Orange County, California; September 20, 1908; collected by H. S. Swarth, orig. no. 7051.

DIAGNOSTIC CHARACTERS: Most nearly like *Scapanus latimanus latimanus* (Bachman) (see Osgood, 1907, p. 52), but

differs from it in much smaller size throughout, particularly small hands and narrow rostrum, and in browner color. Resembles *Scapanus anthonyi* J. A. Allen (1893, p. 200; see also True, 1896, pp. 53, 57, pls. 1–3) in small size, but differs from it in paler coloration, slightly different dimensions, narrower cranium in interorbital region, extremely narrow rostrum, and in presence of all four upper premolars.

General Remarks: In dentition all of the available material of the new form shows the condition normal in *latimanus*, save that in one (no. 2733) one upper unicuspid on the left side is wanting, apparently the canine. In all, the first upper premolar is much reduced in size, and the unicuspidate teeth are irregularly spaced, in these respects as well as in others, differing decidedly from *Scapanus townsendi* of the northwestern corner of California.

So far as we are aware, the only specimen of *S. anthonyi* thus far obtained in any collection from Lower California is the type. This specimen is described and figured in greatest detail by True (1896). There are some discrepancies in the measurements as given by Allen (1893, p. 200) and True (1896, p. 67), but discounting these, there remain sufficient differences in proportions of the cranium to provide alone an adequate basis for separation of *occultus* from *anthonyi*.

The new form is fifteen per cent smaller than *latimanus*. The individuals examined are remarkably uniform in all respects.

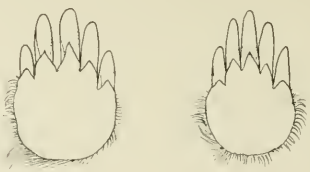

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Fig. 1. Right hand of *Scapanus latimanus latimanus* (Bachman), ♀; no. 3859; La Honda, San Mateo County, California. × 1.33.

Fig. 2. Right hand of *Scapanus latimanus occultus*, new subspecies, ♀; no. 2089; Strawberry Valley, San Jacinto Mountains, California. × 1.33.

The accompanying drawings, as well as the tables of measurements serve to show differences in size between *latimanus* and *occultus*. The extremely small hands with relatively weak claws constitute an excellent character of the newly named form.

Both Allen and True had examples of the southern California mole. The former referred casually to his single specimen from San Bernardino as "similar" to his *anthonyi*. True (1896, pp. 57, 66, 67) includes the few southern California examples at his disposal under "*californicus*" (= *latimanus*), remarking upon the "wide range in variation in size." The series in the Museum collection indicate that all the individuals of the species of *Scapanus* under discussion from any one geographic area show extremely narrow range in variation. This is not only true of size but of proportions of skull, and coloration. In judging of color tone it is almost superfluous to urge that age and state of wear of pelage should always be given due consideration.

Scapanus californicus (= *latimanus*) *minusculus* Bangs (1899, p. 70) was described from a single specimen from Fyffe, Eldorado County, California. Of course it is quite possible that a separate race of *latimanus* occupies the Sierra Nevada area. Bangs's description, and our single example from Yosemite Valley, leave no doubt in our minds, however, that a previously named Sierran form would in no degree compromise the separate recognition of the southern California mole; there appear to be adequate characters to distinguish the two.

Besides the ten specimens of *S. l. occultus* listed in the table of measurements, there are four other skins in the Museum not listed because of imperfect data or lack of skull. These are as follows: nos. 7758, 7759, Los Angeles, April 13, 1909; no. 9058, Arroyo Seco near Pasadena, November 30, 1906; no. 4036, Ventura, May 6, 1906. The latter is without skull or collector's measurements, but in size of hands and feet and in color is (as are the other three) typically *occultus*.

We would be quite justified in using a binomial name for the new form if it were not for a specimen of intermediate nature towards *latimanus* and obtained in an interlying region between the ranges of *occultus* and *latimanus*. This is no. 14645,

Measurements in Millimeters of *Scapanus latimanus* from West Central California

Museum number	Sex	Locality	Total length	Tail vertebrae	Hind foot	Greatest length of skull	Basilar length of Hensel	Interorbital width	Mastoid width	Total length of ramus of mandible	Date
3859[1]	♀	La Honda, San Mateo County	170	45	20	34.2	27.4	7.5	16.2	21.8	November 29, 1907
3860[1]	♂	La Honda, San Mateo County	170	40	22	35.6	29.6	7.7	17.2	23.4	November 30, 1907
3468[2]	♂	Santa Cruz	176	36	22	35.5	28.8	7.6	16.2	22.3	August 14, 1908
6913[3]	♂	Stanford University	170	....	20	35.3	29.0	7.9	17.8	22.6	May 25, 1903
14699[4]	♂	Piedmont, Alameda County	169	31	20	34.7	28.5	7.8	17.3	22.2	May 15, 1911
12694[5]	♂	Bolinas, Marin County	175	35	24	35.6	29.4	7.7	17.0	23.6	March 30, 1911
		Average of the six specimens	172	37.4	21.3	35.1	28.8	7.7	16.9	22.6	

[1] Collector, J. Dixon.
[2] Collector, J. Rowley.
[3] Collector, H. O. Jenkins.
[4] Collector, A. M. Alexander.
[5] Collector, L. Kellogg.

MEASUREMENTS IN MILLIMETERS OF *Scapanus latimanus occultus* FROM SOUTHERN CALIFORNIA

Museum number	Sex	Locality	Total length	Tail vertebrae	Hind foot	Greatest length of skull	Basilar length of Huxley	Interorbital width	Mastoid width	Total length of ramus of mandible	Date
2089[1]	♀	Strawberry Valley, San Jacinto Mts.	146	30	20.0	31.0	25.9	7.1	15.6	19.8	July 15, 1908
2231[2]	♀	Thomas Mt., San Jacinto Mts.	148	34	21.0	31.7	26.1	7.7	.....	20.5	August 19, 1908
2369[2]	♀	Santa Ana Cañon, Orange County	150	33	18.0	31.7	25.7	7.0	15.7	19.8	September 20, 1908
7765[3]	♀	Sierra Madre, Los Angeles County	139	30	.....	31.3	25.5	7.2	15.7	19.7	July 1, 1909
3025[4]	♀	Witch Creek, San Diego County	134	31	19.0	31.8	25.7	7.0	15.5	20.0	September 15, 1908
7639[4]	♀	Warner Pass, San Diego County	138	29	18.5	31.7	26.0	7.3	15.5	20.7	June 28, 1909
2732[4]	♀	Julian, San Diego County	145	31	20.0	31.6	26.0	7.1	15.4	20.2	July 23, 1908
2733[4]	♂	Julian, San Diego County	150	28	19.0	32.0	26.1	7.1	15.6	20.7	August 1, 1908
5235[1]	♂	Pasadena, Los Angeles County	143	30	18.0	.....	25.2	7.2	.....	20.0	May 12, 1904
9518[1]	♂	Pasadena, Los Angeles County	157	32	19.0	.....	.....	7.4	.....	20.9	March 25, 1906
		Average of the ten specimens	145	30.8	19.2	31.6	25.8	7.2	15.6	20.1	

[1] Collector, J. Grinnell.
[2] Collector, H. S. Swarth.
[3] Collector, C. L. Camp.
[4] Collector, F. Stephens.

male, taken at Santa Margarita, San Luis Obispo County, June 3, 1911. In general dimensions and cranial proportions it is nearest *latimanus;* in size of hands and feet it is almost exactly intermediate; in color it is nearest *occultus.* On the whole, it is closest to *latimanus* and is so labeled. But it gives strong basis for belief that there is complete geographic intergradation between *occultus* and *latimanus,* as indicated in the trinomial form of name proposed by us.

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MYOTIS ORINOMUS ELLIOT, A BAT NEW TO CALIFORNIA

BY

J. GRINNELL AND H. S. SWARTH

(Contribution from the Museum of Vertebrate Zoology of the University of California)

While working up the collection of vertebrates obtained by the Museum parties in the San Jacinto region of southern California in the summer of 1908, the authors of the present paper found some difficulty in determining certain small bats of the genus *Myotis*. This led to an overhauling of all the specimens of this genus thus far accumulated by the Museum, with the result that one species was distinguished which hitherto had not been credited to the mammalian fauna of the state.

This form does not belong to any of the species included by Miller (1897) in his revision of the Vespertilionidae. A review of the subsequent papers dealing with species of *Myotis* accounted for all proposed names except *Myotis orinomus* Elliot (1903, p. 228).

Elliot's description applies to our unnamed bats from the San Jacinto region in certain important respects; but in others, such as cranial dimensions, there is marked disagreement, so that comparison of specimens themselves became indispensable.

Through the kind offices of Mr. Wilfred H. Osgood, we have been permitted to examine a topotype and two additional specimens of *Myotis orinomus*, from the Field Museum of Natural History. These are all from the San Pedro Martir region, northern Lower California, Mexico, and bear data as follows: Skin and skull, ♂, no. 10849 (Field Mus.), La Grulla, Lower California, September 11, 1902, collected by E. Heller; skin and

skull, ♀, no. 10850 (Field Mus.), Santa Eulalia, L. C., August 22, 1902, E. Heller; skull only, ♀, no. 15927 (Field Mus.), Vallecitos, L. C., September 26, 1902, E. Heller.

After comparison of this material with that from the San Jacinto Mountains, we are convinced that the latter belongs with Elliot's species. Furthermore, we have collected specimens from other localities in California. These are listed in the accompanying table of measurements, and the following discussion of characters is based upon this California material.

Myotis orinomus Elliot

La Grulla Brown Bat

Basis of Diagnosis: Male adult, no. 2045, Mus. Vert. Zool.; Garnet Queen Mine, 6000 feet, Santa Rosa Mountains, Riverside County, California; June 26, 1908.

Diagnosis: Similar in general characters to *Myotis californicus californicus*, but size slightly larger, colors paler, cranium flatter and rostrum much broader.

General Description: Size small, decidedly less than any other *Myotis* inhabiting California excepting *M. c. californicus*, *M. c. pallidus* and *M. yumanensis*. As compared with *yumanensis, orinomus* is but very slightly smaller in general dimensions, but with distinctly smaller thumb, and much smaller feet, length of foot being seven instead of nine millimeters.

In color above, *orinomus* is tawny olive (of Ridgway's *Nomenclature of Colors*, 1886) instead of broccoli brown, as in *yumanensis*. Beneath, the difference is less marked, but a tawny suffusion is apparent in a much brighter tinge of brown than in any of a very large series of *yumanensis*.

M. orinomus differs from *M. californicus* and *M. c. pallidus* in decidedly larger size throughout; ears, thumb and feet being particularly large; the latter seven instead of five millimeters in length. In color *orinomus* is paler than *californicus*, except below, and very much darker than *pallidus*. *Californicus*, as represented by a specimen (no. 12981) from Yosemite Valley, is deep mummy brown above; *orinomus* is bright tawny olive; while *pallidus* is pale wood brown.

The cranial peculiarities of *orinomus* are marked. The most prominent general feature is the extraordinary flattening of the skull, more extreme, even, than in *M. occultus*. In *yumanensis*, *californicus* and *pallidus* the braincase is relatively inflated, bulging dorsally, so that there is a comparatively deep "saddle" or angle formed by the rostrum and forehead. The accompanying drawing shows this peculiarity of *orinomus*, in comparison

1 2

Fig. 1. *Myotis californicus pallidus* Stephens (1900, p. 153), topotype, ♀; no. 7350; Vallecito, San Diego County, California; May 21, 1909; collected by F. Stephens. × 3.

Fig. 2. *Myotis orinomus* Elliot (1903, p. 228), ♂; no. 2047; Garnet Queen Mine, Santa Rosa Mountains, California; June 26, 1908; collected by H. S. Swarth. × 3.

with *pallidus*. In addition, as viewed from above, the rostral region of the skull is very much broader than in either *yumanensis*, *californicus*, or *pallidus*. Beneath, this breadth is occupied to so large a degree by the molars, which are of greater transverse diameter even than in *yumanensis*, that the palatal width is but little greater than in *californicus*. The tooth row, however, is much longer in *orinomus* than in *californicus*. Although in bulk of skull *orinomus* exceeds *californicus* and *pallidus*, the interorbital constriction in the three species named is about the same, that is, much less than in *yumanensis*. The width of braincase is nearly as great in *orinomus* as in *yumanensis*, but the height is very much less.

Our ten specimens of *Myotis orinomus* from California show a moderate amount of individual variation in the characters pointed out above. In flatness of braincase and broadness of rostrum there is such uniformity as to preclude the possibility of intergradation with any other species of *Myotis* known by us to inhabit California. Its occurrence in the San Jacinto, San Bernardino and Mount Whitney regions, in each of which areas

californicus, *yumanensis*, and *longicrus* have also been found, shows distributional ground for considering *orinomus* as distinct a type as either of these. The evidence at hand is meager, consisting chiefly in the fact that where *orinomus* was obtained in most numbers (Garnet Queen Mine, Santa Rosa Mountains) no other *Myotis* was taken. As far as the facts have appeared, they point to its occupying a zonal position perhaps separate from that of any of the other species, namely, high Upper Sonoran, and this in a semi-arid faunal division.

The material from Lower California is insufficient for a satisfactory basis of comparison, which might lead to detection of slight differences from the northern representative. The two skins are slightly darker than the California series. There is no doubt that both series belong to one species, though there is possibility of subspecific distinction.

It seems strange that this little bat has been so long overlooked. It is quite probable that it has been repeatedly confused with other species, as in the case of our specimen from Doble, in the San Bernardino Mountains (no. 6941), which had been previously lumped in with *Myotis l. longicrus* (see Grinnell, 1908, p. 158)! It is possible, of course, that some earlier name will be found to be applicable. But Miller (1897, pp. 20–38) appears to have satisfactorily disposed of all of the many names proposed by H. Allen, these including all the synonyms which seem to require consideration in this connection.

The manuscript of the present paper was submitted, together with two specimens of the bat in question, to Mr. Gerrit S. Miller, Jr., who writes us in part as follows:

"I have never seen Elliot's *M. orinomus*, so that I am unable to confirm your identification. The animal that you have sent is quite different from any of the recognized species in our collection [that is, United States National Museum], though I find a skull from Dulzura, California (no. 35660), which evidently belongs to the same animal.

"You will notice that in my account of *M. californicus*, I speak of considerable variation in size. I was always puzzled by the Dulzura series which now proves to consist of the two species; but at the time of writing my monograph I was unable to come to any positive conclusion."

List and Measurements in millimeters of *Myotis orinomus* from California

Museum number	Sex	Locality	Date	Total length	Tail vertebrae	Hind foot	Thumb	Forearm	Greatest length of cranium	Zygomatic breadth	Breadth of braincase	Interorbital constriction	Maxillary tooth-row	Height of cranium at bullae
2044[1]	♂	Garnet Queen Mine, 6000 feet, Santa Rosa Mts.,	June 25, 1908	84	38	7.0	4.2	32.0	.....	8.6	6.8	3.1	5.4	....
2045[1]	♂	Garnet Queen Mine, 6000 feet, Santa Rosa Mts.,	June 26, 1908	80	37	6.0	3.9	30.8	13.5	8.7	6.8	3.1	5.4	5.2
2046[2]	♂	Garnet Queen Mine, 6000 feet, Santa Rosa Mts.,	June 25, 1908	79	37	7.0	4.1	31.9	13.4	....	6.8	3.2	5.5	5.3
2047[2]	♂	Garnet Queen Mine, 6000 feet, Santa Rosa Mts.,	June 26, 1908	86	40	8.0	4.6	33.2	14.0	8.7	6.8	3.0	5.4	5.2
2248[2]	♂	Hemet Lake, 4400 feet, San Jacinto Mts.,	Aug. 9, 1908	84	40	8.0	4.0	32.8	13.7	8.6	6.7	3.0	5.2	5.1
6941[1]	♀	Doble, 7000 feet, San Bernardino Mts.,	Aug. 24, 1905	87	38	6.0	4.8	34.6	14.5	8.7	6.9	3.1	5.5	5.2
16300[1]	♀	West slope Walker Pass, 4600 feet, Kern County,	June 23, 1911	82	42	6.5	4.3	32.5	13.9	8.2	6.9	3.1	5.4	5.2
16304[1]	♀	Fay Creek, 4100 feet, near Weldon, Kern County,	July 13, 1911	88	40	7.0	4.7	34.1	14.7	8.9	6.8	3.1	5.5	5.2
16305[1]	♀	Fay Creek, 4100 feet, near Weldon, Kern County,	July 14, 1911	87	40	7.0	4.9	33.0	14.1	. .	6.7	3.0	5.3	5.1
16303[1]	♀	Carroll Creek, 5500 feet, Sierra Nevada, Inyo County,	Sept. 11, 1911	87	45	6.0	4.8	34.3	14.3	8.7	6.7	3.1	5.2	5.3

[1] Collected by J. Grinnell.

[2] Collected by H. S. Swarth.

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THE BIGHORN OF THE SIERRA NEVADA

BY

JOSEPH GRINNELL

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THE BIGHORN OF THE SIERRA NEVADA

BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

There is plenty of unquestionable testimony indicating the former occurrence of mountain sheep widely through the high Sierra Nevada of California, almost uninterruptedly from the vicinity of Mount Shasta southward to the Mount Whitney region. But the more recent published statements (Stephens, 1906, p. 58, and Allen, 1912, p. 25) have been to the effect that the form represented is now probably extinct.

Members of the Sierra Club, however, have reported the presence of sheep within a few years in the precipitous area at the extreme headwaters of the Kings and Kaweah rivers; and in the late summer of 1911, the author learned from cattlemen and others in Inyo County that sheep, far from being extinct, still occur in bands of as many as forty individuals along the Sierran divide in the Rae Lake and Kearsarge Pass country.

Since the specific identity of the sheep of the high Sierras appeared to be quite unknown, it became highly desirable that specimens be obtained. To this end the California Fish and Game Commission granted the necessary permit for the collecting of some specimens for the Museum of Vertebrate Zoology, Miss Annie M. Alexander provided a special fund to meet the expenses of the trip, and H. A. Carr was detailed to do the field work necessary.

In the persons of E. H. Ober and J. W. Dronillard, of Big Pine, and C. J. Walters, of Independence, who knew thoroughly the country to be visited, Carr found all that could be asked for in the way of practical assistance. The three succeeded in

locating a band of sheep in the vicinity of Mount Baxter, twelve miles in an air line northwest of Independence, Inyo County. Four of the animals were secured during October, 1911, and these, together with the Museum's specimens of the desert and Rocky Mountain bighorns enumerated in Table I, form the basis of the present study.

Ovis cervina sierrae, new subspecies

Sierra Nevada Bighorn

Type: Male, age about five years; skin, horns and complete skeleton, no. 16360, Mus. Vert. Zool.; east slope Mount Baxter, 11,000 feet, Sierra Nevada, Inyo County, California; October 20, 1911; collected by H. A. Carr; orig. no. 659.

Diagnostic Characters: Resembles *Ovis c. nelsoni* C. H. Merriam (1897, p. 217) but general size greater, ears and tail shorter, coat grayer and very much heavier, and horns in cross-section at base more nearly of a circular outline than triangular. Resembles *Ovis c. cervina* Desmarest (see Allen, 1912, p. 23), but size slightly less, pelage not quite so heavy, coloration very much paler, and horns in cross-section at base not triangular.

Comparative Features: *Pelage.*—The sheep of the high Sierra Nevada, as just characterized, shows an important adaptive feature evidently correlated with the coldness of its habitat, namely, superabundant pelage. This alone readily distinguishes it from *O. c. nelsoni.* Seasonal variation has of course been taken into account in determining this difference. In detail, this greater degree of hairiness shows itself conspicuously on the rump, where the hair of the white patch is 47 millimeters deep instead of only 20 millimeters as in *nelsoni* of the same season; the ears of the Sierran form are far more abundantly clothed both outside and inside; the nuchal mane is prominent, the constituent hairs 200 millimeters back of the ears being 82 millimeters long as against 45 in *nelsoni*; the scrotum and insides of thighs are well clothed with hair in *sierrae,* where *nelsoni* is scantily haired. In fine, the whole hirsute equipment of *sierrae* as compared with that of *nelsoni* corresponds to what one would expect in animals of cold and warm regions respectively. In

this matter of pelage *sierrae* much more closely resembles *cervina* than it does *nelsoni*.

Coloration.—In general tone of coloration *sierrae* is distinctly grayer, more ashy, than either *nelsoni* or *cervina*, of comparable pelage. The Sierran form is perceptibly paler in color than either, though the contrast is strongest with *cervina*. The white of rump area, belly, and hind sides of legs appears to be purer in *sierrae;* but this is probably more apparent than real, and is explanable because of the much longer hair, which, especially when separated, shows a great extent of clean surface. The rump patch is so much heavier haired in *sierrae* than in *nelsoni*, that the effect reminds one strongly of the antelope. There is no appreciable difference between the two sheep, however, in relative extent of light and dark areas.

Ears.—The smallness of the ears in the Sierran sheep as contrasted with the relative largeness of these members in the desert form, has several parallels among other mammals. The conditions of sound transmission in the two sorts of environment are probably to be called into account, so that as with quantity of pelage, the differential feature in question is adaptive. The differences in size of ears in the two forms are readily appreciable upon comparison of the dry skins; the collectors' measurements of "height of ear," although probably not ascertained in the different instances upon a uniform basis, give a fair index of the amount of difference (see table of measurements).

Tail.—The tail as shown from the external measurements is distinctly shorter in *sierrae* than in *nelsoni*. In the latter it is scantier haired, so that in effect it resembles the tail of *Odocoileus hemionus* as compared with *O. columbianus*, though the difference is not so extreme as between these two deer.

General size.—The tables of measurements show *sierrae*, as compared with *nelsoni*, to be distinctly larger, always considering age; for it appears that sheep keep on growing throughout their lifetime, though at a decreasing rate as age advances. Total length, hind foot, and length of hoofs are all greater in *sierrae*. In these respects, the approach is again towards *cervina*.

Horns.—A single feature of the horns is apparently of differential value, namely their form in cross-section at the base. In

I. List of Specimens of Mountain Sheep of the *Cervina* Group in the Museum of Vertebrate Zoology

Mus. No.	Sex	Nature of material	Exact Locality	Date	Collector	Orig. No.
			Ovis cervina nelsoni			
2319	♂	Skin, horns and complete skeleton	Deep Cañon, 3000 feet, Santa Rosa Mts., Riverside Co., Cal.	June 19, 1908	J. Grinnell	2271
3252	♂	Skin, horns and complete skeleton	25 miles east of Julian, San Diego Co., Cal.	Aug. 24, 1908	H. S. Swarth	6873
3251	♂	Skin, horns and skull	25 miles east of Julian, San Diego Co., Cal.	Sept. 18, 1908	F. Stephens	1481
2320	♀	Skin, horns and complete skeleton	Deep Cañon, 3000 feet, Santa Rosa Mts., Riverside Co., Cal.	Oct. 3, 1908	F. Stephens	1493
10588	♀	Skin, horns and complete skeleton	Near Colorado River, 20 miles north of Picacho, Imperial Co., Cal.	April 13, 1910	J. Grinnell	9290
10589	♂	Skin, horns and complete skeleton	Near Colorado River, 20 miles north of Picacho, Imperial Co., Cal.	April 13, 1910	J. Dixon	1110
10592	♂	Incomplete skin, horns and skull	Near Colorado River, 20 miles north of Picacho, Imperial Co., Cal.	Dec. 28, 1909	.....	9316 J. G.
10593	♂	Incomplete skin, horns and skull	Near Colorado River, 20 miles north of Picacho, Imperial Co., Cal.	Dec. 28, 1909	.....	9317 J. G.
10590	♀	Imperfect skin	Near Colorado River, 20 miles north of Picacho, Imperial Co., Cal.	Fall, 1909	.....	9318 J. G.
10591	♀	Imperfect skin	Near Colorado River, 20 miles north of Picacho, Imperial Co., Cal.	Fall, 1909	.....	9319 J. G.
4571	♂	Skull and horns	Cocopah Mts., northern Lower California	.....	.....	.....
4740	♂	Skull and horns	Funeral Range, near Death Valley, Inyo Co., Cal.	Nov. 1906	.....	.....
			Ovis cervina sierrae			
16360	♂	Skin, horns and complete skeleton	East slope Mt. Baxter, 11000 feet, Sierra Nevada, Inyo Co., Cal.	Oct. 20, 1911	H. A. Carr	659
16357	♂	Skin, horns and complete skeleton	East slope Mt. Baxter, 11000 feet, Sierra Nevada, Inyo Co., Cal.	Oct. 4, 1911	H. A. Carr	646
16359	♂	Skin, horns and complete skeleton	East slope Mt. Baxter, 11000 feet, Sierra Nevada, Inyo Co., Cal.	Oct. 4, 1911	H. A. Carr	648
16358	♀	Skin, horns and complete skeleton	East slope Mt. Baxter, 11000 feet, Sierra Nevada, Inyo Co., Cal.	Oct. 4, 1911	H. A. Carr	647
			Ovis cervina cervina			
4375	♂	Skin, horns and complete skeleton	North Saskatchewan River, Alberta, Canada	Nov. 24, 1903	.....	.....

11. Measurements in Millimeters of Mountain Sheep of the *Cervina* Group

(For details pertaining to capture of each specimen, see preceding table.)

Museum number	Sex	General Locality	Estimated Age	Collector's measurements: Total Length	Tail Vertebrae	Hind Foot	Ear from hind base	Right horn: Circumference at base	Length around front curve	Horns, tip to tip outside	Greatest length of front hoof	Greatest length of hind hoof
				Ovis cervina nelsoni								
2319	♂	Santa Rosa Mountains, Cal.	6 yrs.	1460	111	410	135	363	622[1]	. ..	82.8	66.7
3252	♂	Eastern San Diego County, Cal.	10 yrs.	1600	127	400	127	371	920	.....	83.1	65.2
3251	♂	Eastern San Diego County, Cal.	6 yrs.	1390	122	400	130	343	686	522	80.3	68.0
2320	♀	Santa Rosa Mountains, Cal.	2 yrs.	1245	105	365	....	123	220	243	64.2	53.8
10588	♀	Colorado River near Picacho, Cal.	7 yrs.	1370	120	365	.....	152	387	418	78.0	65.7
10589	♂	Colorado River near Picacho, Cal.	2 mos.	890	70	310	110	50	27	85	51.4	47.3
10592	♂	Colorado River near Picacho, Cal.	8 yrs.	.....	. ..	.. ..	.....	357	802[1]	489		
10593	♂	Colorado River near Picacho, Cal.	6 yrs.	. ..	.....	... ..	.....	332	700	460		
4571	♂	Cocopah Mts., Lower California	12 yrs.	. .	.....	....	.....	391	826[1]	552		
4740	♂	Near Death Valley, Cal.	5 yrs.	.....	.....	.. ..	.....	301	624	570		
				Ovis cervina sierrae								
16360	♂	Mt. Baxter, Sierra Nevada, Cal.	5 yrs.	1570	100	420	110	315	600	588	84.0	73.2
16357	♂	Mt. Baxter, Sierra Nevada, Cal.	3 yrs.	1582	110	420	120	280	530	554	77.0	65.0
16359	♂	Mt. Baxter, Sierra Nevada, Cal.	2 yrs.	1445	70	400	120	172	271	322	72.9	65.0
16358	♀	Mt. Baxter, Sierra Nevada, Cal.	3 yrs.	1385	70	395	106	131	256	357	70.4	61.7
				Ovis cervina cervina								
4375	♂	North Saskatchewan R., Alberta	7 yrs.	. .	.....	.....	....	375	734	550	82.8	70.3

[1] Very much of end gone by wear.

nelsoni this is approximately triangular, with the orbital angle less than a right angle; furthermore, this corner is produced far down onto the forehead. In *sierrae* the form in cross-section is more nearly circular, with the orbital and medial angles both obtuse and neither corner produced. The condition of the

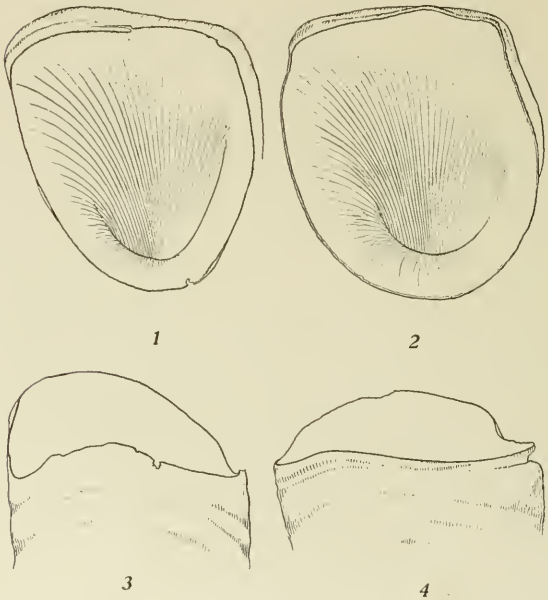

Fig. 1. *Ovis cervina nelsoni*, no. 4740: right horn, as viewed directly towards orifice, anterior edge at top; upper left hand corner is the orbital angle; note distinct triangularity of outline, with orbital angle acute. × ½.

Fig. 3. The same horn viewed from directly behind, across orifice; note production of corner at orbital angle. × ½.

Fig. 2. *Ovis cervina sierrae*, no. 16360: right horn as viewed directly towards orifice, anterior edge at top; note rounded outline with upper angles both obtuse. × ½.

Fig. 4. The same horn viewed from directly behind, across orifice; note evenly balanced outline, neither corner being produced. × ½.

corner, whether produced or not, is clearly consequent upon the angularity of the horn at base. The two older rams of *sierrae* (nos. 13360, 13357) agree in the peculiarity indicated, as compared with *nelsoni* especially of nearly the same age (nos. 10593, 4740, 2319, in particular). All of the *nelsoni* over four years of age and the single *cervina*, show this distinct triangularity, and the orbital angle is always acute.

Crania.—The writer has attempted to establish cranial characters for the three subspecies of sheep available in the present study. C. H. Merriam (1901, p. 30) and Elliot (1903, p. 239), especially the former, in describing new races of sheep, point to various cranial features as providing specific characters. The present writer confesses his inability, with the material in hand, to establish any one cranial character to his satisfaction. He is impressed with the considerable changes in the proportions correlated with increase of the mass of the horn-cores with age. It seems clear that interorbital width, occipital proportions, and other adjacent dimensions must undergo important differential modification with age. And to separate out any character of systematic value would be possible only with very large series of each race, so that the results of individual growth with advancing age could be properly discerned.

The following are some cranial dimensions of a selected skull of each of the three forms of sheep here treated. As will be seen upon a perusal of the table of general measurements, the first two are nearly of an age, while the last is somewhat older. Age determination, however, is not possible to any close degree of accuracy, especially in the older individuals.

Name	Museum number	Basilar length	Maxillary toothrow	Width of palate between posterior molars	Interorbital width	Greatest length of nasals	Width of nasals	Occipital width	Width of rostrum flush with front of molar series	Occipito-nasal length
Ovis c. nelsoni	4740	249	82.0	51.6	115.8	100.0	47.6	94.9	50.7	201
Ovis c. sierrae	16360	249	88.6	52.7	122.5	110.6	52.8	95.8	49.7	209
Ovis c. cervina	4375	278	85.6	49.6	130.9	120.7	54.4	107.2	61.8	237

The chief inference to be drawn from the above table is the same intermediate position of *sierrae* in regard to size of skull as is shown by the general body measurements. It is possible that relatively long tooth-row, great size of molars, narrow palate, and narrow rostrum are specific features of *sierrae;* but, as intimated above, the material at hand is insufficient to warrant any assertions in regard to cranial characters.

Nomenclature and Geographic Considerations: In an important paper just published, dealing with the nomenclature of the North American sheep, Allen (1912, pp. 20, 25) revives the old name *Ovis californianus*, of Douglas, for a hypothetical race "formerly" inhabiting "the Cascade Mountains of southern Washington and Oregon, and Mount Shasta and the mountainous country to the eastward in northern California," and "now probably extinct." Allen establishes "Mount Adams, Yakima County, Washington," as the type locality of "*Ovis cervina californiana.*" He states (1912, p. 22) that "as it [this form] is now probably extinct at the type locality and is unrepresented by typical specimens in Museums, its real status in relation to other forms can probably never be satisfactorily determined."

The existence of a distinct race, with the above range, for which the name *californiana* is usable, is suggested by Allen thus wholly "on geographical grounds." On the same grounds the present writer would point out the probability of the former existence of separate races in the Cascades, and in the Sierra Nevada, especially southerly in the latter mountain system. It does not appear logical to assume the identity of the new form here characterized with that of Washington. The employment here of the name *californiana* would be dependent upon such assumption.

In the mind of the present writer, the geographical probabilities are that the range of *sierrae* extended north to include the Mount Shasta region. If there was a hiatus between a Cascade race and a Sierran, both being Boreal in zonal occurrence, the line of demarcation was more probably north of Shasta than south. This is in accord with the conclusions of C. H. Merriam (1899, p. 83) that the Klamath Gap to the north has

operated as a more efficient barrier to the distribution of Boreal forms north and south than the Pitt River or Feather River gaps to the south, or both the latter combined.

A pertinent query would be as to the geographic relationship of *sierrae* with *nelsoni*. The latter was described (Merriam, 1897, p. 218) from the Grapevine Mountains, Nevada, just over the state line from California, adjacent to Inyo County. In an air line the type localities of *sierrae* and *nelsoni* are less than 95 miles apart. The possibility suggests itself that the same individuals can easily wander back and forth between the desert ranges and the high Sierra Nevada, and may have done so in recent times.

First, to establish the distinctness of actual topotypes of *nelsoni* from *sierrae*, request was made of H. W. Henshaw, Chief of the Bureau of Biological Survey, for the loan of topotype material. This was freely granted, with the result that two out of the very series upon which Merriam based his description, have been available for comparison at this Museum. These specimens are: Skin and skull ♀, aged three years, no. $\frac{28384}{40488}$ (U. S. Nat. Mus.); skin and skull ♂, aged two years, no. $\frac{28382}{40486}$ (U. S. Nat. Mus.). Both were taken June 4, 1891. As regards pelage they are extremely worn and faded. Our two examples from the Santa Rosa Mountains, of same season, precisely resemble them in all pelage characters. Enough of the summer pelage is left on one of the Mount Baxter *sierrae* (no. 16358), to demonstrate that even in summer the alpine and desert forms show the differential features of pelage. Because of the youth of the exact topotypes of *nelsoni*, nothing is ascertainable from general size or cranial dimensions. But the Museum's five-year-old ram skull and horns (no. 4740) from the Funeral Range, which is merely the southward extension of the Grapevine Mountains, making the points of capture not to exceed 25 miles apart, can be considered a practical topotype. And it is identical with the comparable rams from elsewhere on the southeastern deserts. To sum up, there *is* a desert race of sheep as distinct from the Sierran, and the name *nelsoni* was based upon examples of the desert form.

In the second place, there are practically no exceptions to the rule that the Boreal zones on the Sierras possess species and usually genera distinct from those of the Sonoran zones of the desert. We may cite here the coyotes, foxes, rabbits, wood-rats, and spermophiles. If isotherms are so potent as barriers in the case of other organisms it seems reasonable to expect the sheep to have been limited in their distribution by these same factors. It is thus, on distributional grounds, improbable that sheep wander indiscriminately back and forth between the high, cold Sierras and the hot desert ranges, general assumption to the contrary notwithstanding.

Mr. Carr was especially instructed to gather all obtainable information as regards this very point. Without here going into detail, the gist of the information gathered by him from mountaineers and residents of Owens Valley is that the Sierra Nevada bighorns in the Mount Baxter region at the present time do not range north of Taboose Pass, nor east across Owens Valley, though they do descend the east slope of the Sierras to the foothills in midwinter.

It is probable, therefore, that the Sonoran and Boreal forms of sheep do not intermingle, although their ranges in the Inyo region closely adjoin.

The treatment of the forms under discussion as subspecies of one species, and the consequent adoption of the trinomial form of name for each of them, is in accord with the now dominant view of mammalogists. The most recent expression (Allen, 1912, pp. 20, 21), is that there are two groups of sheep in North America, the northern *Ovis dalli* group, and the southern *Ovis cervina* group. These two groups are treated as distinct species. It is to the second that the two forms inhabiting California belong. It is not, however, to be inferred that anyone has proven actual intergradation between *cervina* and *sierrae*, *sierrae* and *nelsoni*, or *nelsoni* and *cervina*. Whatever may have been the geographic relations between these forms a century ago is probably now beyond the possibility of proof. The forms persist merely as isolated colonies of very much restricted range.

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A NEW *PEROGNATHUS* FROM THE SAN JOAQUIN VALLEY, CALIFORNIA

BY
WALTER P. TAYLOR

THE BEAVER OF WEST CENTRAL CALIFORNIA

BY
WALTER P. TAYLOR

Smithsonian Institution
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A NEW *PEROGNATHUS* FROM THE SAN JOAQUIN VALLEY, CALIFORNIA

BY

WALTER P. TAYLOR

(Contribution from the Museum of Vertebrate Zoology of the University of California)

During the months of March, April, and May, 1911, a party from the Museum of Vertebrate Zoology carried on biological exploration in the northern, central and southern parts of the San Joaquin Valley and also in the Carrizo Plain of San Luis Obispo County. The existence in the San Joaquin Valley of two races of *Perognathus longimembris* is one of the first results apparent.

Perognathus longimembris neglectus, new subspecies

McKittrick Pocket Mouse

TYPE: Male adult, no. 14526, Mus. Vert. Zool.; McKittrick, Kern County, California, altitude 1111 feet; May 18, 1911; collected by H. S. Swarth and W. L. Chandler; orig. no. 8986.

DIAGNOSTIC CHARACTERS: Larger in all dimensions than its nearest relative, *Perognathus longimembris longimembris* (see tables of measurements, pp. 164, 165), being in total length 12.25 per cent larger; tail vertebrae 8.43 per cent; occipito-nasal length 7.84 per cent; mastoid breadth 7.18 per cent; interorbital constriction 14.37 per cent. Paler than *Perognathus l. longimembris*. The tone of coloration is approximately the same in the two subspecies, the evident dissimilarity between them being due to a difference in extent of black tipping on the hairs.

Material: The basis for this description is as follows: Forty-nine specimens of *Perognathus longimembris longimembris*: Corral Hollow, eight miles southwest of Tracy, San Joaquin County, 5; Sweeney's Ranch, 22 miles south of Los Baños, Merced County, 3; Lane Bridge, ten miles north of Fresno, Fresno County, 2; Raymond, Madera County, altitude 940 feet, 3; Jesbel, 540 feet, eight miles west of Raymond, Madera County, 1; Tipton, altitude 266 feet, Tulare County, 6; Earlimart, or Alila, altitude 280 feet, Tulare County, 5; eight miles northeast of Bakersfield, 21; Tejon Cañon, 1; Rose Station, 1; San Emigdio, 1; the last four stations in Kern County, and the last three specimens from the Biological Survey collection, U. S. National Museum. Forty-one of *Perognathus longimembris neglectus*: McKittrick, Kern County, 37; Carrizo Plain, seven miles southeast of Simmler, San Luis Obispo County, 3; Santiago Spring, Carrizo Plain, San Luis Obispo County, 1.

Descriptive Remarks: *Coloration.*—All the specimens considered were collected between March 16 and May 28, so presumably all the adults exhibit the same pelage, the more or less worn winter coat. The new form, *Perognathus longimembris neglectus*, is very much lighter than *P. l. longimembris*. The ground coloration is apparently the same in both, and comes nearest the ochraceous-buff of Ridgway's *Nomenclature of Colors* (1886). The dissimilarity in appearance, as already noted, is the result of a difference in extent of black tipping on the hairs. *P. l. neglectus* is practically pure ochraceous-buff in coloration, there being merely a suggestion of black. On the other hand, *P. l. longimembris* is much darkened, the pure ochraceous-buff being discernible only along the lateral line, in a spot behind each ear, and on outer sides of fore and hind limbs. Ears in *neglectus* not so dusky on inner surface. Tail lighter colored than in *longimembris*.

Fore and hind feet and underparts pure white. Two specimens of *longimembris* from Earlimart (nos. 14501, 14503) are unlike the rest of the series, in that they lack the dorsal darkening. The tone of their coloration approaches ochraceous instead of ochraceous-buff, however, so making them distinct from *neglectus*. They are smaller, too, than the specimens of the latter.

The two specimens, possibly belonging to *longimembris*, from Sites, Colusa County, were not included in the table of measurements, as they are aberrant in respect to size. Their teeth show them to be younger than the other adults measured, and yet their measurements are comparatively great, decidedly above the average for the rest of the series. These examples suggest that another form of *longimembris* exists in the Sacramento Valley.

Our series of young animals of the two forms are for the most part not comparable. The few juvenals of *P. l. longimembris* in the Museum are with some exceptions younger than any of our extensive series (comprising thirty specimens) of *P. l. neglectus*. One of the latter contained seven embryos. Two specimens (nos. 14540 from McKittrick, and 14519 from Bakersfield) seem to be comparable as to age. The example of *longimembris* is slightly darker in general coloration than the specimen of *neglectus*. Two very young specimens (nos. 14514 from Bakersfield, and 14548 from McKittrick) exemplify an exceptional color relation, the specimen of *neglectus* being darker than the one of *longimembris*. Four other specimens of *longimembris* (nos. 14506, 14520, 14521, 14523) are properly not comparable with the series of *neglectus*. They are somewhat darker than the McKittrick series. The coloration toward the tip of the tail in juvenals of *longimembris* is definitely darker than in *neglectus*.

On the whole the series of juvenals, or adolescents, of the new subspecies is uniformly pale in coloration. They are near drab-gray dorsally, lightening to drab or ecru drab laterally; a definite lateral line of buff; sides of face and top of nose buff, modified slightly with black in the latter region; the buffy coloration of the lateral line extends nearly to the heel on the outside of the hind leg, sometimes extending a short distance onto the fore-limb externally; feet white; a small white spot under the ear, and a light spot just back of the ear, varying from white to buff; tail buff, thinly haired, sometimes gray dorsally, but in most cases not clearly bi-color, becoming gray toward tip;

underparts pure white. In the adult pelage the hair is not so silky and soft, the tail is more thickly haired, and the coloration of the tail and upper parts becomes rich ochraceous-buff.

Cranial Characters.—The skulls of *P. l. longimembris* and *P. l. neglectus* are similar in shape. Interorbital constriction in the new form actually broader. The table of measurements shows the dimensions of *neglectus* to be uniformly greater than those of *longimembris*, and indicates that on the average the ratio of the greatest mastoid breadth to the basilar length is less in *neglectus*.

Measurements.—As indicated above, the percentage difference in leading measurements is considerable. Osgood's statement (1900, p. 13) that individual variation is not great in the group does not seem to be borne out by a study of twenty-eight males of *longimembris*. In these the range of variation amounts to 25.4 per cent of the total length, and 30.5 per cent of the length of tail vertebrae. These figures are of course subject to correction, for the specimens came from different localities, and some of the variation is doubtless due to age, though care was exercised in selecting the comparable adults. Stage of pelage and degree of wear of the teeth were the chief characters used in determining age. The fact of the comparatively large variation thus reduces the importance of the size distinction between the two forms.

GEOGRAPHIC RANGE

Specimens of *P. l. neglectus* were secured at McKittrick, Kern County; at Santiago Spring, Carrizo Plain, San Luis Obispo County; and seven miles southeast of Simmler, San Luis Obispo County. Statement of range is not possible beyond the region implied in the position of these three localities, one in the southwestern portion of the San Joaquin Valley, the other two in the Carrizo Plain district. The subspecies is apparently Lower Sonoran chiefly, though its occurrence at Santiago Spring indicates that it may invade lower Upper Sonoran.

P. l. longimembris was taken by the Museum party at the localities above mentioned (p. 156). Osgood (1900, p. 34) examined specimens from the following additional localities: Lodi

and Ripon, San Joaquin County; Oakdale, Stanislaus County; Livingston, Merced County; Huron, Fresno County; Threerivers, Tulare County; and Walker Basin, Delano, and Bakersfield, Kern County. Consequently the range of *Perognathus l. longimembris* may be said to be the Lower Sonoran and lower Upper Sonoran zones of the San Joaquin Valley, except the southwestern portion.

STATUS

Perognathus longimembris neglectus is the largest member of the *panamintinus* group in California, in size equalling *Perognathus amplus* Osgood (from Fort Verde, Arizona). It is certainly, as would be expected, most closely related to its nearest neighbor, *longimembris*, and for the following reasons: (a) In general coloration it is very close to *longimembris;* (b) the latter form, as regards size, approaches it more closely than does any other member of the *panamintinus* group in California; (c) the skull is in the main similar, though larger; (d) the geographical probabilities so indicate.

Neglectus need be confused with no other member of the *panamintinus* group. Larger size serves to distinguish it from *P. p. panamintinus* C. H. Merriam. From *P. p. bangsi* Mearns it is differentiated by a more ochraceous-buff coloration and larger size. Lighter coloration and larger size separate it from *P. p. brevinasus* Osgood. The uniformity of coloration which is so evident in *longimembris* (see Osgood, 1900, p. 33) is emphasized to a still greater degree in *neglectus*.

The question arises as to the status of the new form from the current point of view of processes of evolution. Is it merely an environmentally induced geographic race or an ontogenetic one, of such a nature that, were it transported into the area inhabited by *Perognathus l. longimembris*, it would revert immediately to the type exhibited by that subspecies? Or does it represent a true germinal variant? Experimental investigation might furnish illuminating data on these points.

It is possible that isolation has been a condition in the differentiation of the two forms. Buena Vista Slough, which probably constitutes a partial barrier, extends from Tulare Lake

to Buena Vista and Kern lakes. It should be noted that the representatives of the genera *Dipodomys* and *Perodipus*, as well as of the subgenus *Perognathus*, are different on the McKittrick and Bakersfield sides of the slough. On the other hand, the species of the genera *Citellus* and *Ammospermophilus*, and of the subgenus *Chaetodipus*, of *Perognathus*, are the same on the two sides. These facts would indicate that while the barrier in question is not highly efficient, taking all the forms into consideration, it may have been of some importance in the formation of the McKittrick pocket-mouse. On the other hand it should be noted that specimens of *longimembris* from Huron, Fresno County, west of the San Joaquin River farther northward, were examined by Osgood, and that examples of *longimembris* from Tracy and Los Baños, also west of the river, are not appreciably different from those from districts east of the stream. This, of course, militates against the possibility of the river's being a barrier of sufficient importance to be a condition in the divarication of the two forms.

Large, dark races of a species are sometimes found in the humid coast belt, when small, light forms occur in the arid interior. For example, in northern North America, the smaller, lighter subspecies of *Peromyscus maniculatus* (see Osgood, 1909), namely *nebrascensis*, *arcticus*, and *artemisiae*, occur in the more arid interior regions, while the larger, darker ones, *oreas*, *hylacus*, *keeni*, *macrorhinus*, and the closely related *silkensis* and *prevostensis*, are found in the more humid coast districts. The new subspecies of *Perognathus* here described, which occurs in a locality more arid than that in which *Perognathus l. longimembris* is found, is paler, but also *larger*, which condition is contrary to what might be expected from the contemplation of such a case as that cited above.

In the diagram of the distribution of variation, specimens of *Perognathus l. longimembris* are represented by Arabic numerals placed in the upper portions of the squares, and in the frequency curves by black dots and solid lines. *Perognathus l. neglectus*, on the other hand, is indicated by Roman numerals placed in the lower portions of the squares, and in the frequency curves by open circles and dotted lines.

Thirty-seven specimens of *Perognathus l. longimembris* and ten of *P. l. neglectus*, all comparable adults, furnish the basis for the diagram. As practically no dimensional differences between males and females are apparent, both sexes are included.

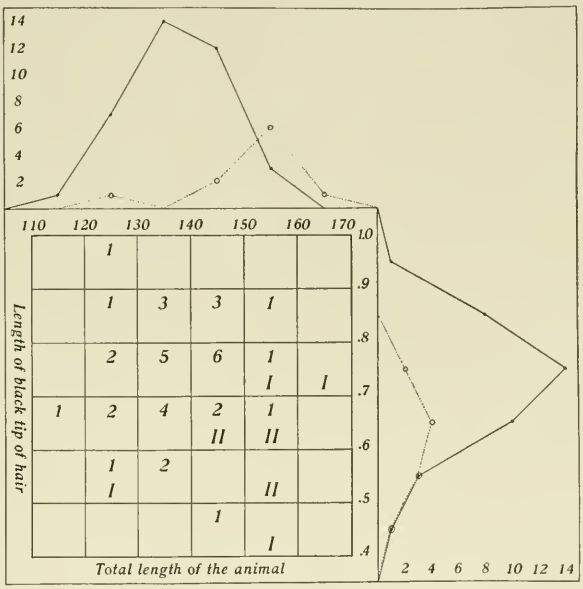

Fig. 1.—Correlation of variation in length of black tipping on hairs and total length of individual in *Perognathus l. longimembris* and *Perognathus l. neglectus*.

Reference to the diagram shows a general correlation between large total length and short black tipping of the hair. Examination of the hairs with a binocular microscope disclosed two types, one including spiny hairs apparently solidly pigmented for their entire length; the other, hairs with plumbeous bases, ochraceous-

buff shafts, and black tips. The measurements of black tip were made by ocular micrometer on hairs of the second type only.

In the frequency curve for black tipping of the hairs, the mode of *neglectus*, while different from that of *longimembris*, is seen to fall within the normal range of variation of the latter. The curve does not, however, adequately show the difference in pigmentation, for the following reasons: it does not record (a) the different density of pigment in the black tips of the hairs in the two subspecies; nor (b) different width of the black tipping, for in many instances the tip was not solidly black, but had rather a line of black upon it; nor (c) the different proportions of the two *types* of hairs, namely those having the shafts solidly pigmented from base to tip, and those having tips only black.

NOMENCLATURAL HISTORY

Apparently no specific name already given to western pocket-mice of this subgenus is available for the new subspecies. The name *Perognathus parvus* (Peale) formerly applied to the San Joaquin form now regarded as *Perognathus l. longimembris*, has been definitely shown to be correctly assigned to the much larger species taken in Oregon, probably in the neighborhood of The Dalles, by the Wilkes Exploring Expedition (see C. H. Merriam, 1889, p. 3, and Osgood, 1900, p. 35). The following authors have referred San Joaquin Valley specimens to *Perognathus parvus*: Baird (1857, p. 425), specimen from Kings River, California; Coues (1875, pp. 303–305) based the name on Baird's Kings River specimen and dissected an alcoholic specimen from Fort Tejon; True (1882, p. 474) discussed Baird's *parvus* and published data on additional specimens from Fresno in the San Joaquin Valley. Coues' (1875, p. 305) provisional name for the race exemplified by his specimen from Fort Tejon, namely *longimembris*, must therefore stand (see Osgood, 1900, p. 34) for the darker subspecies of the San Joaquin Valley.

Osgood (1900, p. 34) based his description of *Perognathus l. longimembris* on specimens from Fresno, the type locality of *inornatus* C. H. Merriam. The type of *longimembris*, from Fort Tejon, is said to be immature, but is stated to show the narrow

interorbital space peculiar to the San Joaquin Valley form. This would practically preclude the possibility of the Fort Tejon specimens being referable to the subspecies inhabiting the San Joaquin west of Buena Vista Slough, since the latter race has a broad interorbital space. As will be noted from the table of comparative measurements, the percentage difference between the averages of the males of the two forms is greater, with respect to interorbital constriction, than in the case of any other skull measurement given, and this character (broad interorbital space) is uniform throughout the series of adults of *neglectus*.

Osgood (1900, p. 34) further states that the only available topotype of *Perognathus l. longimembris* is a young adult which agrees perfectly with specimens from Fresno and other points in the San Joaquin Valley. Also that two young specimens from San Emigdio and Rose Station, both being near Fort Tejon, are also clearly the same as those from Fresno. These statements are confirmed by an examination of the three specimens in question, kindly loaned to the writer from the Biological Survey collection through the courtesy of Mr. H. W. Henshaw, Chief of the Bureau.

Osgood concludes that the name *longimembris* should be applied to the animal recently called *inornatus* (C. H. Merriam, 1889, p. 15). It thus becomes apparent that *Perognathus inornatus*, type locality Fresno, California, was based on this darker subspecies described from Fort Tejon, and that the McKittrick form is the one to which the new name should be given.

Measurements of *Peromyscus longimembris longimembris* Cones

All measurements in millimeters[1]

	Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Occipito-nasal length[2]	Mastoid width	Length of interparietal	Greatest width of interparietal	Interorbital constriction	Nasals	Ratio greatest mastoid breadth to basilar length of Hensel
Average of males of *P. l. longimembris*	137.9	68.8	18.8	16.63	22.72	12.53	2.75	3.84	4.87	8.37	75.80
Maximum of males in millimeters	155.0	79.0	21.0	18.30	24.50	13.40	3.20	4.50	5.30	9.40	81.50
Minimum of males in millimeters	120.0	58.0	16.0	15.10	21.60	12.00	2.30	2.70	4.60	7.50	69.40
Average of the females of *P. l. longimembris*	135.1	68.0	19.0	15.96	21.70	12.16	2.70	3.56	4.78	7.68	77.01
Maximum of females in millimeters	151.0	79.0	20.0	16.80	22.60	12.60	2.90	4.40	5.00	7.90	81.00
Minimum of females in millimeters	125.0	61.0	18.0	15.30	20.80	11.70	2.50	2.90	4.50	7.30	72.00
Range of variation (males) in millimeters (per cent in case of the ratio)	35.0	21.0	5.0	3.20	2.90	1.40	0.90	1.80	0.70	1.90	12.10
Range of variation (males) per cent (taken on basis of average of males)	25.4	30.5	26.6	19.22	12.75	11.17	32.71	46.89	14.37	22.70	15.95

[1] For method of taking measurements see Taylor, 1911, p. 206.

[2] Taken along median line from most posterior point on supraoccipital to most anterior point on nasals.

MEASUREMENTS OF *Perognathus longimembris neglectus*, new subspecies

All measurements in millimeters[1]

	Total length	Tail vertebrae	Hind foot	Basilar length of Hensel	Occipito-nasal length[2]	Mastoid breadth	Length of interparietal	Greatest width of interparietal	Interorbital constriction	Nasals	Ratio greatest mastoid breadth to basilar length of Hensel
Average of males of *P. l. neglectus*	154.8	74.6	20.3	18.40	24.50	13.43	2.88	3.94	5.57	8.80	72.95
Maximum of males in millimeters	164.0	83.0	22.0	19.10	25.00	13.50	3.20	4.50	5.80	9.10	75.20
Minimum of males in millimeters	141.0	62.0	18.5	17.70	24.00	13.30	2.50	3.30	5.40	8.50	70.70
Average of females of *P. l. neglectus*	155.5	76.0	21.0	18.35	24.37	12.86	2.87	4.15	5.22	9.02	70.30
Maximum of females in millimeters	160.0	79.0	21.0	18.50	24.70	12.90	3.40	4.60	5.30	9.50	71.10
Minimum of females in millimeters	148.0	70.0	21.0	18.00	23.90	12.80	2.20	3.90	5.20	8.70	69.70
Millimeters difference between averages of males of *P. l. longimembris* and *P. l. neglectus*	16.9	5.8	1.5	1.77	1.78	0.90	0.13	0.10	0.70	0.43	2.85
Per cent difference between averages of males of *P. l. longimembris* and *P. l. neglectus* (taken on basis of average of *longimembris*)	12.25	8.43	7.98	10.64	7.84	7.18	4.73	2.60	14.37	5.14	3.76

[1] For method of taking measurements see Taylor, 1911, p. 206.

[2] Taken along median line from most posterior point on supraoccipital to most anterior point on nasals.

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THE BEAVER OF WEST CENTRAL CALIFORNIA

BY

WALTER P. TAYLOR

(Contribution from the Museum of Vertebrate Zoology of the University of California)

The interest of Miss Annie M. Alexander in the problem of the status of western beavers resulted in her securing for the Museum the material on the basis of which this description is drawn up. This consists of a series of ten skins and skulls, with several complete skeletons, from the region of the confluence of the Tuolumne and San Joaquin rivers. Comparison with pertinent specimens from elsewhere shows that the California material belongs to a species distinct from other beavers. The status of western beavers will be considered in more detail in a later paper.

Castor subauratus, new species

Golden Beaver

TYPE.—Collected at Grayson, Stanislaus County, San Joaquin River, California; no. 12654, Univ. Calif. Mus. Vert. Zool.; ♀ adult, skin and complete skeleton; February 21, 1911; trapped by Jack Doyle.

GENERAL CHARACTERS.—In size equals the largest examples of western beavers at hand. Coloration lighter than in *Castor canadensis leucodontus*, but not so light as in *Castor canadensis frondator*. Skulls with nasal bones more expanded, and foramen magnum wider in proportion to length, than in any other western beaver.

Color.—Similar to *Castor canadensis frondator* but darker. The hair dorsally is much the same in coloration, which is hazel to clay color of Ridgway's *Nomenclature of Colors* (1886). The underfur is in *subauratus* nearer chocolate than seal brown, while in *frondator* it approximates Prout brown. Ventral underfur in *subauratus* sepia, in *frondator* gray, varying about drab gray, ecru drab and drab.

Castor subauratus possesses a golden sheen dorsally and ventrally, which is nearly lacking in *leucodontus*. Hair ventrally in the new species varies about buff (ochraceous-buff to pinkish buff), while in *leucodontus* it is chestnut. Coloration of the area about the base of the tail not so deep in *subauratus* as in *leucodontus*.

Castor subauratus has less hair than has *Castor c. leucodontus*, but more than *Castor c. frondator*.

Skull.—There are many differences between the skulls of *Castor subauratus*, *Castor c. leucodontus*, and *Castor c. frondator*, the most important of which are the form of the nasals, which are more expanded in *subauratus* than they are in either of the other two subspecies; and the shape of the foramen magnum, which is proportionally very wide as compared with its height in the California species, much more so than in the two subspecies with which it is here compared. The ratio of the width of nasals to basilar length is 22.4 per cent in the type of *subauratus* (no. 12654, Mus. Vert. Zool.); in *leucodontus* (no. 12107, Mus. Vert. Zool.) it is 19.8 per cent; while in *frondator* (no. 60354, U. S. Nation. Mus.) it is 20.9 per cent. The ratio of the vertical diameter of the foramen magnum to basilar length is 8.0 per cent in the type of *subauratus* (no. 12654, Mus. Vert. Zool.); in *leucodontus* (no. 12107, Mus. Vert. Zool.), it is 11.25 per cent; while in *frondator* (no. 60354, U. S. Nation. Mus.) it is 12.4 per cent.

Tail.—Proportions of tail separate *Castor subauratus* from *Castor c. frondator*. Average ratio width of tail to length in *Castor subauratus* is 42.42 per cent (extremes 37.6–45.2); in *frondator* (no. 20751, U. S. Nation. Mus.) 49.1 per cent; in *leucodontus*, 41.32 per cent (extremes 31.8–51.0).

Measurements of Type.—Total length, 1171 mm., hind foot, 196, ear, 31; length scaled portion of tail, 320; basilar length of Hensel, 126.3; zygomatic width, 103.4; mastoid width, 70.5; interorbital constriction, 28.3; length of nasals, 54.4; width of nasals, 28.3; maxillary tooth-row, 34.5; height of foramen magnum, 10.1; transverse width of foramen magnum, 18.1; greatest length of mandible, angle to anterior surface alveolus of incisor, 111.3; angle of mandible to coronoid, 62.3; ratio width of nasals to basilar length, 22.4 per cent; ratio maxillary tooth-row to basilar length, 27.3 per cent.

Remarks.—The golden beaver is a strongly marked species, the characters of which are evident throughout our series of specimens. At the present time the species is approaching extinction, although the enforcement of the present protective law may enable it to regain a foothold.

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THE TWO POCKET GOPHERS OF THE REGION CONTIGUOUS TO THE LOWER COLORADO RIVER, IN CALIFORNIA AND ARIZONA

BY
JOSEPH GRINNELL

Smithsonian Institution
JUN 14 1912
National Museum

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BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

The explorations carried on in 1910 along the lower Colorado River from Needles to the Mexican line produced large collections of mammals, which, however, included but few specimens of the genus *Thomomys*. Only one individual was obtained on the Arizona side, and on the California side none was found above the apex of the delta region below Yuma.

An attempt to fix the specific status of these gophers resulted in a fair degree of certainty that distinct forms were represented on the two sides of the river, and that the specimens from the California side were identical with our material already at hand from several points in the Imperial Valley.

It happened, however, that the Museum contained but two specimens of gopher from the type locality of *Thomomys perpallidus* C. H. Merriam, described from specimens obtained at Palm Springs, at the extreme northwestern end of the Colorado desert. Correspondence elicited the information that the material in the Biological Survey collection was also unsatisfactory for comparison. And as a proper knowledge of the characters and variation in the first described species of the general area, namely, *Thomomys perpallidus*, seemed an essential basis for treatment of the other species from the desert regions of the

southwest, it became necessary for the time being to defer action upon the Colorado River material.

In February, 1912, the writer was fortunately able to pay a brief visit to Palm Springs in the interests of the Museum, and he succeeded in securing a quite satisfactory series of thirty-eight specimens of *Thomomys perpallidus*. Twelve of these are comparable males. The entire material provides the requisite basis for comparative treatment of the forms from the Colorado River region, and proves them to be distinct one from the other, and both different from *perpallidus*.

Thomomys albatus, new species

Imperial Valley Gopher

Type: Male adult; no. 10618, Mus. Vert. Zool.; California side of the lower Colorado River at the old Hanlon Ranch, near Pilot Knob, Imperial County; May 7, 1910; collected by J. Dixon; original no. 1396.

Diagnostic Characters: As compared with *Thomomys perpallidus*, colors extremely pale; size large; tail long; feet broad; zygomata most widely spreading in maxillary portion, that is, anteriorly.

Description of Type: *Coloration* very pale cream buff above (very much whiter than in *T. perpallidus*, and in *T. perpes* of the Mohave Desert), becoming dusky around nose and mouth; a small patch of slaty hairs beneath ears; tail and feet scantily clothed with whitish hairs; inside of ears with fine slaty hairs, but outside with coarser hairs of the color of back; vibrissae whitish; lower surface white, tinged with straw yellow on throat, fore legs, and anal region; the white of the lower surface extends high on the sides, blending gradually with the cream buff of the mid-dorsal region; hairs of the dorsal region pale plumbeous at base. There are evidences of molt; the newly appearing hairs are faintly dusky-tipped, but there is no evidence of diverse seasonal coloration.

Skull (as compared with *T. perpallidus* and *T. perpes*) large (see table, p. 176, and plate 5); rostrum heavy; incisors massive and more incurved; nasals and premaxillary tongues broad

posteriorly; zygomata widely spreading; zygomatic breadth greatest anteriorly, that is, across maxillary portion; this portion also projecting ventro-laterally, so that there is conspicuously deep ventral excavation of the anterior zygomatic root as viewed from in front (shown also in slight degree in ventral view, fig. 3, pl. 5); auditory bullae relatively depressed.

Measurements: See table, p. 176.

Distribution: There are in the Museum, twenty-three specimens of this form, as follows, all from Imperial County: Colorado River bottom near Pilot Knob, 8; Salt Creek, 8; southern side of Salton Sea, 6; Carrizo Creek, 1.

Remarks: In the original description of *Thomomys perpallidus* (C. H. Merriam, 1886, p. 588), no exact type locality was designated; but Stephens (1906, p. 138) gives it as Palm Springs, he having collected the material upon which Merriam based his description. Vernon Bailey informs me that the Biological Survey considers Palm Springs, once called Agua Caliente, as the type locality. Hence I use the series in the Museum from that exact place as representing *perpallidus* in the most restricted sense. A perusal of the literature shows that, as is usual in similar cases, the earliest name for a pale-colored gopher has at different times been attached to specimens from a large area around the Colorado desert, even to northeastern Arizona. But as material has accumulated, various forms have been cut out from the periphery, with successive studies more and more narrowing the area of application of the name *perpallidus*.

My present study is a still further refinement, wholly justifiable with the new material in hand. The material as yet available, is, however, insufficient to establish whether or not the ranges of the different recognized forms are sharply defined or whether the distribution is practically continuous, and is accompanied by intergradation in characters.

Two conclusions, however, seem probable: one is, that *perpallidus* as redefined does not occur east of the Colorado River; the other, that on the lower parts of the Colorado desert it is replaced by the form here named *albatus*. It may even be probable that *perpallidus* is restricted to a narrow belt along the eastern base of the mountains lying west of the Colorado desert.

Its range is possibly determined by the presence of alluvial soil at the mouths of the cañons whose streams vanish into the desert below.

Thomomys albatus is apparently confined to that portion of the Colorado desert occupied by the delta of the Colorado River and hence having fine alluvial soil, and further, to that portion of the delta region lying *west* of the main channel of the Colorado River, and above the reach of recent overflow.

Albatus is, judging from descriptive literature as well as from all available material, the *whitest* gopher known, and this peculiarity is quite as pronounced in very small young as in adults. This extreme pallor in an animal of subterranean habits, one which is seldom exposed to the light, is difficult of explanation, when it is borne in mind that the gophers of the coast belt of California are very dark colored. The soil of the habitat of *albatus* is usually perceptibly moist, not conspicuously less so than that in the San Diegan district. It would appear that in this case relative humidity could not so well be called into account, nor intense light, as in the cases of mammals foraging above ground. Yet this gopher is whiter than any other mammal of the Imperial region, though all are pale-colored as compared with relatives in neighboring zoogeographic areas.

Thomomys chrysonotus, new species

Ehrenberg Gopher

Type: Male young adult; no. 10617, Mus. Vert. Zool.; Ehrenberg, Yuma County, Arizona; March 27, 1910; collected by F. Stephens; original no. 2540.

Diagnostic Characters: Size small; colors pale; similar to *Thomomys perpallidus*, but dorsal coloration with a distinctly golden cast, ears very small, and skull in proportion to size much heavier.

Description of Type: *Coloration* ochraceous-buff above, with a tinge of ochraceous-rufous or golden mid-dorsally; facial region the same, slightly obscured with dusky around the nose; beneath whitish with much plumbeous of the bases of the hairs showing through; feet and tail white; dorsal color rather

abruptly defined along sides against white of lower surface; dorsal pelage at base deep plumbeous; vibrissae whitish; ears thinly clad with fine slaty hairs, but not surrounded by dusky patch.

Skull (as compared with *T. perpallidus* and *T. albatus*) small, but relatively massive (see table, p. 176, and plate 5); rostrum short and broad, broadest in its middle portion; incisors heavy and incurved; posterior ends of premaxillary tongues reaching scarcely beyond nasals; zygomata not spreading conspicuously, nor prominently angled; jugal bars approaching one another anteriorly, that is, zygomatic width greatest posteriorly; interorbital constriction very wide; auditory bullae relatively much inflated.

Measurements: See table, p. 176.

Distribution: Type and only specimen from Ehrenberg, Yuma County, Arizona.

Remarks: I sent the type specimen to Vernon Bailey, of the United States Biological Survey, who marked it tentatively *Thomomys perpallidus*. Comparison, however, of this specimen with the topotype series of *perpallidus* now available, discloses differences which fall far outside of the range of individual variations in *perpallidus*. The distinct golden color of *chrysonotus*, even brighter than in *T. perpes*, together with certain cranial peculiarities, lead me to suggest its near affinities, not with *perpallidus* or *albatus*, but with forms to the east and north.

MEASUREMENTS IN MILLIMETERS OF ADULT MALES OF THE SPECIES OF *Thomomys* FROM THE COLORADO DESERT REGION

Museum number	Sex	Locality	Collector	Date	Total length	Tail vertebrae	Hind foot	Greatest length of skull*	Basilar length of Hensel	Zygomatic width	Interorbital constriction	Nasals	Diastema	Mastoid width	Width of rostrum
				Thomomys albatus											
10618	♂	Pilot Knob, Calif.	J. Dixon	May 7, 1910	272	100	35.0	44.7	38.6	28.0	6.4	15.2	16.2	22.1	8.7
7301	♂	Salt Creek, Calif.	F. Stephens	Apr. 28, 1909	246	93	34.0	42.4	36.9	26.6	6.6	14.7	15.5	21.4	9.0
7303	♂	Salt Creek, Calif.	F. Stephens	Apr. 27, 1909	255	93	33.0	42.3	36.3	27.6	6.7	15.0	14.5	21.9	8.9
7310	♂	Salt Creek, Calif.	F. Stephens	Apr. 27, 1909	254	91	34.0	45.3	38.8	29.7	6.7	16.0	16.7	24.0	9.1
				Thomomys chrysonotus											
10617	♂	Ehrenberg, Ariz.	F. Stephens	Mar. 27, 1910	217	73	30.0	37.7	31.0	23.2	6.6	13.8	11.6	19.1	8.2
				Thomomys perpallidus											
13 adult ♂♂		Palm Springs, Calif.	J. Grinnell	Dec. 27, 1903 Feb. 9, 10, and 11, 1912:											
				Average,	235	83	31.1	40.6	34.7	25.0	6.3	14.8	14.4	20.3	8.3
				Maximum,	247	92	32.0	42.8	36.8	26.8	6.8	15.5	15.6	21.8	9.0
				Minimum,	213	63	29.0	37.7	32.5	22.8	6.0	13.8	13.2	19.0	7.8
				Mean.	230	77	30.5	40.2	34.6	24.8	6.4	14.6	14.4	20.4	8.4

* See Taylor, 1911, p. 206.

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Transmitted February 28, 1912.

PLATE 5

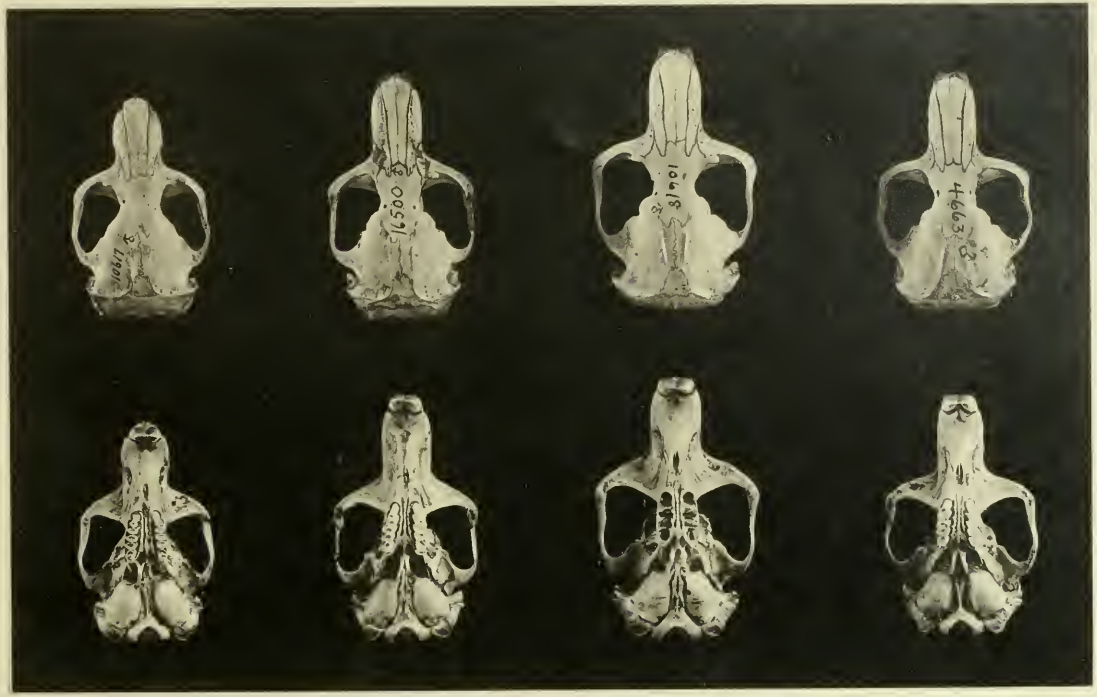
Dorsal and ventral view of same skull in each case;
very close to natural size.

Fig. 1. *Thomomys chrysonotus*, type; male, no. 10617; Ehrenberg, Arizona; March 27, 1910. Note small size, short heavy rostrum, wide interorbital constriction, narrow and rounded zygomatic arches, evenly terminating nasals and premaxillary tongues posteriorly, and rounded auditory bullae.

Fig. 2. *Thomomys perpallidus*, topotype; male, no. 16500; Palm Springs, California; February 10, 1912.

Fig. 3. *Thomomys albatus*, type; male, no. 10618; Colorado River bottom near Pilot Knob, California; May 7, 1910. Note large size, widely spreading zygomatic arches flaring anteriorly, broad nasals and premaxillary tongues, deep baying in anterior zygomatic root, and depressed auditory bullae.

Fig. 4. *Thomomys perpes*, probably not typical; male, no. 4663; Victorville, Mohave Desert, California; December 27, 1906.



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THE SPECIES OF THE MAMMALIAN GENUS *SOREX* OF WEST-CENTRAL CALIFORNIA

WITH A NOTE ON THE VERTEBRATE PALUSTRINE FAUNAS OF THE REGION

BY
JOSEPH GRINNELL

UNIVERSITY OF CALIFORNIA PRESS
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WITH A NOTE ON THE VERTEBRATE PALUSTRINE FAUNAS OF THE REGION

BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

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INTRODUCTION

Insectivores are surprisingly scarce in most parts of California as compared with the eastern United States. The aridity of the Pacific district, especially as concentrated into the long dry season, seems to be the deterrent factor; for within the state named we find a remarkably close parallel between amount of rainfall and degree of abundance of shrews and moles. Thus

the southeastern deserts are practically without any representatives of these groups at all; a very few, relatively, occur in the southern coast district; the numbers increase up the Sierra Nevada and towards the northwest, until a state of extreme plenitude is met with in the higher parts of the Sierra Nevada and in the Humboldt Bay region.

It is evident that these geographic relationships in numbers may show limitation by temperature as well as humidity. Taking numbers of individuals into account, rather than species, though both hold in a way, there appears to the writer to be closest dependence of insectivore population upon dampness of climate if not also upon the permanent presence of standing or running water.

It may be said of the restricted genus *Sorex*, as far as west-central California is concerned, that all of the six species are at least semi-aquatic. Their peculiarly interrupted local distribution thus becomes explicable.

That shrews regularly inhabit the salt marshes of San Francisco Bay was to the writer's knowledge first established in 1908 by Mr. Joseph Dixon, who captured a number of specimens in the vicinities of Palo Alto and Petaluma in his search for representatives of the rodent genus *Reithrodontomys*. Dixon's specimens were acquired by Miss Annie M. Alexander and presented by her to the University of California Museum of Vertebrate Zoology, where they form part of the basis of the present paper.

More recently Miss Alexander and Miss Louise Kellogg discovered the presence of shrews in the marshes at the confluence of the Sacramento and San Joaquin rivers. By repeated efforts these collectors obtained for the Museum the series of ten specimens enumerated beyond under the description of the remarkable new species *Sorex sinuosus*.

From the uplands of west-central California only scattering examples have been secured, most of these being from the humid coast belt. To show the scarcity of shrews away from the humid coast belt, attention may be called to the fact that in three months' trapping in the summer of 1912, the two Museum collectors so engaged found but two specimens of shrews among the many hundreds of small mammals captured.

It would appear, however, that the present study is warranted, even though far from an ideal quantity of material is as yet available. Since difficulty has been experienced by the author in learning how to determine the species of shrews described in previous literature, he has tried to provide here a ready means for identifying at least those six species thus far known to occur in the restricted region roughly indicated in the term west-central California.

I have given up trying to use tooth characters among the species here dealt with, because of the smallness of the available series of each, and because of the extraordinary amount of wear to which shrews' teeth are subject, with resulting profound modification in relative size and pattern. Inexperience in studies upon teeth is another good reason for my refraining from expressing opinions based upon dentition.

The opportunity is taken in this paper to describe and name a race of the Monterey shrew, from the western flank of the Sierra Nevada, and also to offer a few comments upon the general faunistic peculiarities of the marshlands of west-central California.

KEY TO THE SHREWS OF WEST-CENTRAL CALIFORNIA

By Size

Extremely small (total length about 90 mm., hind foot about 11 mm.) ..... *Sorex californicus*

Fairly small (total length about 102 to 105 mm., hind foot about 12 mm.)

Color warm brown ..... *S. vagrans*

Color sooty brown or black

Braincase high ..... *S. halicoetes*

Braincase flattened ..... *S. sinuosus*

Medium-sized (total length about 116 mm., hind foot about 15 mm.) ..... *S. montereyensis*

Large (total length about 146 mm., hind foot about 17 mm.) ..... *S. pacificus*

By Color

Grayish brown, with pepper-and-salt effect; silvery beneath; size extremely small ..... *Sorex californicus*

Warm brown; brownish gray beneath

Bright rusty brown; size very large (length about 146 mm.) ..... *S. pacificus*

Vandyke brown; size small (length about 105 mm.) ..... *S. vagrans*

Sooty brown, or black; dull dark brownish beneath

Tail sharply bicolor, dusky above, whitish beneath; body above varying from slate-black to dull seal brown, beneath washed with sepia.....*S. montereyensis*

Tail uniform in color, dusky both above and below

Body black dorsally with steely reflections; ears colored like body .....*S. sinuosus*

Body sooty brown dorsally; ears warm brown in contrast with body color.....*S. halicoetes*

CRANIAL MEASUREMENTS[1]

Name	Mus. No.	Sex	Age	Locality	Greatest length of skull[2]	Width of braincase	Height of braincase	Ratio, height to width of braincase
Sorex vagrans	11,826	♂	yg. ad.	Eureka, Calif	16.1	8.2	5.4	66%
Sorex halicoetes ..	3,639	♂	yg. ad.	Palo Alto, Calif.	17.5	8.5	5.3	62%
Sorex californicus..	10,847	♂	yg. ad.	Petaluma, Calif.	16.4	7.8	4.6	59%
Sorex sinuosus	16,470	♀	yg. ad.	Grizzly Island, Calif.	16.8	7.6	4.3	57%
Sorex montereyensis	3,467	♀	yg. ad.	Monterey, Calif.	19.2	9.0	5.5	61%
Sorex pacificus.....	11,749	♂	old ad.	Eureka, Calif.	22.4	10.9	6.0	55%

[1] Measurements of single, selected skulls are given rather than averages because of the paucity of exactly comparable (as to age), and at the same time unbroken, material. All measurements are in millimeters.

[2] Including incisors.

1 2 3 4 5 6

Figs. 1–6. Braincases of shrews, as viewed in outline from directly behind; note varying ratio of height to width, in other words, degree of "inflation." All × 1½.

1. *Sorex vagrans vagrans*, ♀; Ferndale, Humboldt County, California; no. 11830, Mus. Vert. Zool.
2. *Sorex halicoetes*, ♀; Palo Alto, Santa Clara County, California; no. 3635, Mus. Vert. Zool.
3. *Sorex sinuosus*, ♀; Grizzly Island, Solano County, California; no. 16470, Mus. Vert. Zool.
4. *Sorex californicus*, ♂; Petaluma, Sonoma County, California; no. 10848, Mus. Vert. Zool. (This skull is broken on top.)
5. *Sorex montereyensis*, ♀; Monterey, Monterey County, California; no. 3467, Mus. Vert. Zool.
6. *Sorex pacificus*, ♂; Trinidad, Humboldt County, California; no. 11,791, Mus. Vert. Zool.

Sorex vagrans vagrans Baird

Wandering Shrew

Original description.—*Sorex vagrans* (Cooper MS) Baird (1857), pp. 15–18, pl. 18, figs. 5, 6.

Type locality.—Shoalwater Bay, Pacific County, Washington.

Coloration.—Above uniform vandyke brown (darker, approaching bistre, in winter pelage); lower surface grayish brown approaching drab in tone; fur at base everywhere slate black; feet and tail dull drab above, slightly paler beneath.

Cranium.—In lateral outline high; braincase inflated, with height great in proportion to width. See figure 1 and table of cranial measurements.

Measurements.—Nine specimens, from Humboldt County, California, measure, average and extremes: Total length 105.5 mm. (102–110), tail vertebrae 42.2 (31–48), hind foot 12.8 (12–13).

Range.—Riparian and palustrine associations of the Transition zone in the northwestern humid coast belt. Localities represented by specimens in the Museum of Vertebrate Zoology are: Eureka, Arcata, Ferndale, and Cuddeback, Humboldt County; Novati Point, Marin County. Merriam (1895, p. 68) records specimens from Crescent City, Del Norte County; Monterey, Monterey County; and San Mateo, San Mateo County. The latter is a locality close to the known range of the form here named *S. halicoetes*, and Merriam's specimen from there may possibly have belonged to this form.

Sorex halicoetes, sp. nov.

Salt Marsh Shrew

Type.—Skin and skull, ♂ young adult; no. 3,638, Mus. Vert. Zool.; salt marsh near Palo Alto, Santa Clara County, California; May 6, 1908; collected by J. Dixon; orig. no. 218.

Diagnostic characters.—Nearest like *sorex vagrans vagrans* cranially, but in color very much darker, being deep bistre on both surfaces, with an approach to sooty seal brown dorsally; ears of a different color from rest of head.

Coloration.—Above deep bistre changing to sooty seal brown dorsally, nearly black on rump; lower surface bistre, slightly paler on chin and throat, and blending rather abruptly along sides with deeper tone of back; ears fringed with vandyke brown hairs, in marked con-

trast with color of rest of head; fur at base slate-black; feet and tail unicolor, dull sepia; whiskers blackish. Winter skins are somewhat darker than summer ones.

Cranium.—Of the high, arched type, as in *S. vagrans*. See figure 2 and table of cranial measurements.

Measurements.—See table.

Range.—Salt marshes bordering the south arm of San Francisco Bay, at least from near Belmont, San Mateo County, around to Melrose, Alameda County. For localities see table.

Remarks.—Sorex halicoetes resembles *S. sinuosus* in notably blackish coloration; but *sinuosus* is most extreme in this respect. The larger size, brown ears, and totally different cranial outline in *halicoetes* separates it from *sinuosus*. From *S. v. vagrans, halicoetes* is distinguished at a glance by its dark colors, sooty instead of warm vandyke brown above, and bistre instead of silvery brown beneath; the ears of *halicoetes* are of the same color as the whole dorsal surface (including ears) of *vagrans*. While these differences in coloration are considerable, comparison of skulls shows no differential features of moment; so that the near relationship of *halicoetes* with *vagrans* seems probable. When the pelage of *halicoetes* is very much worn, the general color is dulled by the slaty bases of the hairs showing through, the superficial colored portions being much reduced. In fresh pelage there is some variation in the purity of the sooty brown tone of coloration. In some skins there is a distinct mottling in fine pattern, due to an admixture of minute hair-tippings of light brown.

List and Measurements in Millimeters of *Sorex halicoetes*

Mus. No.	Sex	Locality	Date	Collector	Total length	Tail vertebrae	Hind foot
3,627	♂	Belmont, San Mateo Co., Calif.	Mar. 21, '08	J. Dixon	110	40	13
3,632	♂	Redwood City, San Mateo Co., Calif.	Feb. 1, '08	J. Dixon	108	41	13
10,844	♂	Redwood City, San Mateo Co., Calif.	Dec. 19, '08	J. Dixon	103	40	13
10,845	♂	Redwood City, San Mateo Co., Calif.	Dec. 19, '08	J. Dixon	105	39	13
3,634	♂	Palo Alto, Santa Clara Co., Calif.	Feb. 15, '08	J. Dixon	100	38	13
3,635	♀	Palo Alto, Santa Clara Co., Calif.	May 6, '08	J. Dixon	105	39	12
3,636	♀	Palo Alto, Santa Clara Co., Calif.	May 6, '08	J. Dixon	104	38	12
3,637	♀	Palo Alto, Santa Clara Co., Calif.	May 6, '08	J. Dixon	108	40	12
3,638	♂	Palo Alto, Santa Clara Co., Calif.	May 6, '08	J. Dixon	108	40	12
3,639	♂	Palo Alto, Santa Clara Co., Calif.	May 6, '08	J. Dixon	106	40	13
16,611	..	Haywards, Alameda Co., Calif.	.....	W. O. Emerson	.....	....	....
3,628	♀	Elmhurst, Alameda Co., Calif.	Apr. 1, '08	J. Dixon	109	41	13
3,629	♀	Elmhurst, Alameda Co., Calif.	Apr. 1, '08	J. Dixon	100	40	12
3,630	♀	Elmhurst, Alameda Co., Calif.	Apr. 1, '08	J. Dixon	109	41	13
3,631	♂	Elmhurst, Alameda Co., Calif.	Apr. 1, '08	J. Dixon	108	39	12
12,728	♂	Melrose, Alameda Co., Calif.	Dec. 16, '10	A. M. Alexander	100	37	12
			Average of 15 specimens		105.5	39.5	12.5

Sorex californicus C. H. Merriam

California Shrew

Original description.—*Sorex californicus* Merriam (1895), pp. 80, 81; pl. 12, figs. 6, 7.

Type locality.—Walnut Creek, Contra Costa County, California.

Coloration.—Above drab, approaching sepia mid-dorsally and paling laterally; a mixture of whitish-tipped hairs gives a decided pepper-and-salt effect; lower surface silvery whitish, with a faint drab tinge; tail and feet dull drab, slightly paler beneath; fur at base plumbeous.

Cranium.—Small; braincase much flattened, in lateral outline on top together with rostrum approaching a straight line; width great in proportion to height. See figure 4 and table of cranial measurements.

Measurements.—See table.

Range.—Riparian and palustrine associations chiefly of the uplands, along the inner coast ranges from Rumsey, Yolo County, south to near Los Banos, Merced County; also margins of salt marshes around San Francisco Bay. For localities represented by specimens in this Museum, see table. Other record stations are: Glen Ellen, Sonoma County (Merriam, 1895, p. 81); Berkeley, Alameda County (Merriam, l. c., and Stone, 1904, p. 587); La Honda, San Mateo County (Allen, 1896, p. 269).

List and Measurements in Millimeters of *Sorex californicus*

Mus. No.	Sex	Locality	Date	Collector	Total length	Tail vertebrae	Hind foot
18,481	♀	Rumsey, Yolo Co., Calif.	June 25, '12	W. P. Taylor	93	38	12
3,642	♀	Petaluma, Sonoma Co., Calif.	Mar. 28, '08	J. Dixon	95	31	11
10,846	♀	Petaluma, Sonoma Co., Calif.	Dec. 22, '08	J. Dixon	90	35	12
10,847	♂	Petaluma, Sonoma Co., Calif.	Dec. 24, '08	J. Dixon	93	30	11
10,848	♂	Petaluma, Sonoma Co., Calif.	Dec. 24, '08	J. Dixon	92	33	11
10,849	♀	Petaluma, Sonoma Co., Calif.	Dec. 29, '08	J. Dixon	92	33	11
3,640	♂	Redwood City, San Mateo Co., Calif.	Jan. 11, '08	J. Dixon	89	35	11
3,641	♂	Redwood City, San Mateo Co., Calif.	Jan. 11, '08	J. Dixon	86	32	10
3,633	♀	Palo Alto, Santa Clara Co., Calif.	Feb. 15, '08	J. Dixon	85	28	10
16,612	..	Haywards, Alameda Co., Calif.	Jan. 25, '06	W. O. Emerson	....	....	....
16,613	♀	Haywards, Alameda Co., Calif.	Dec. 26, '06	W. O. Emerson	....	....	....
16,614	♂	Haywards, Alameda Co., Calif.	Feb. 9, '07	W. O. Emerson	....	....	....
18,482	♀	Walnut Creek, Contra Costa Co., Calif.	July 14, '12	W. P. Taylor	99	37	12
16,662[1]	..	Byron, Contra Costa Co., Calif.	May 16, '12	R. R. Houston	81	31.4	11.6
14,642	♂	Los Banos (22 mi. south), Merced Co., Calif.	Mar. 30, '11	C. H. Richardson	86	30	11
				Average of 12 specimens	90	32.8	11.1

[1] Alcoholic.

Sorex sinuosus, sp. nov.

Suisun Shrew

Type.—Skin and skull, ♀ young adult; no. 16,470, Mus. Vert. Zool.; Grizzly Island, near Suisun, Solano County, California; January 5, 1912; collected by A. M. Alexander; orig. no. 1,902.

Diagnostic characters.—Nearest like *Sorex californicus* cranially, but in color totally different, being blackish, with steely reflections dorsally; peculiar also in general size, ratio of tail to body and size of foot.

Coloration.—Above black mid-dorsally, with a distinct steely sheen; sides and lower surface, in general effect, deep clove brown; viewed closely there is to be seen an intermixture of bistre and grayish; fur at base slate-black; tail unicolor, sooty seal brown; feet (dried) hair brown; whiskers black.

Cranium.—Like that of *S. californicus*, nearly straight-topped in lateral profile, conspicuously flattened. See figure 3 and table of cranial measurements.

Measurements.—See table.

Range.—Known only from the type locality, namely, the brackish marshes of Grizzly Island, bordering Suisun Bay. See list of specimens.

Remarks.—*Sorex sinuosus* resembles *S. californicus* in shape of skull, but is larger, and very much darker; *californicus* is silvery gray beneath, conspicuously different from the deep clove brown of the same area in *sinuosus;* the former exhibits a grayish, pepper-and-salt appearance above, as contrasted with the blackish hue above in *sinuosus*. In spite of these external differences, of great degree as compared with conditions among other species of shrews, the similarity in cranial outline argues the nearest relationship of *sinuosus* to be with *californicus*. *Sinuosus* in external appearance resembles *halicoetes* closely, but cranially the latter belongs to the *vagrans* group of species. I am unable to detect dental characters usable to my satisfaction in separating any of these species. Winter skins of *sinuosus* are blackest, with metallic sheen most conspicuous. In late summer pelage there is pronounced dulling of the sheen, apparently because of loss of hair-tips.

List and Measurements in Millimeters of *Sorex sinuosus*

Mus. No.	Sex	Locality	Date	Collector	Total length	Tail vertebrae	Hind foot
16,467	♀	Grizzly Island, Solano Co. Calif.	Nov. 25, '11	A. M. Alexander	102	42	12
16,468	♀	Grizzly Island, Solano Co. Calif.	Dec. 15, '11	A. M. Alexander	92	37	12
16,469	♀	Grizzly Island, Solano Co. Calif.	Jan. 4, '12	A. M. Alexander	99	39	12
16,470	♀	Grizzly Island, Solano Co., Calif.	Jan. 5, '12	A. M. Alexander	99	37	12
16,471	♀	Grizzly Island, Solano Co., Calif.	Jan. 13, '12	A. M. Alexander	99	38	12
16,472	♀	Grizzly Island, Solano Co., Calif.	Nov. 25, '11	L. Kellogg	100	41	13
18,700	♂	Grizzly Island, Solano Co., Calif.	Aug. 24, '12	A. M. Alexander	111	41	12
18,701	♀	Grizzly Island, Solano Co., Calif.	Aug. 25, '12	L. Kellogg	106	37	13
18,702	♂	Grizzly Island, Solano Co., Calif.	Sept. 6, '12	A. M. Alexander	113	37	12
18,703	♀	Grizzly Island, Solano Co., Calif.	Sept. 7, '12	A. M. Alexander	103	38	12
			Average of 10 specimens		102.4	38.7	12.2

Sorex montereyensis montereyensis C. H. Merriam

Monterey Shrew

Original description.—*Sorex montereyensis* Merriam (1895), p. 79.

Type locality.—Monterey, Monterey County, California.

Coloration.—In summer pelage, dull seal brown, in some specimens approaching sepia; in winter pelage sooty clove brown. Beneath but slightly paler in either pelage and of same shade; fur at base slate-black; tail sharply bicolor, seal brown above, dull white beneath; feet (dried) drab; whiskers plumbeous.

Cranium.—Large; braincase moderately inflated, though not conspicuously arched. See figure 5 and table of cranial measurements.

Measurements.—Fourteen specimens, from Monterey, Santa Clara, Alameda, Marin and Mendocino counties, measure, average and extremes: Total length 116.1 mm. (111–126), tail vertebrae 51.5 (46–55), hind foot 14.7 (13–16). Nineteen specimens from Humboldt County, measure: Total length 125.8 (116–133), tail vertebrae 59.9 (54–65), hind foot 14.7 (14–16). It looks as though there were a separately recognizable race in the Humboldt Bay region, but lack of specimens of the near-related *Sorex trowbridgei*, from the coast district of Oregon and Washington, prevents determination of this point at this time.

Range.—Upland riparian association in the Transition and high Upper Sonoran zones of the humid coast belt. Specimens in the Museum represent the following localities: Monterey, Monterey County; Stevens Creek Canyon, Santa Clara County; Berkeley, Alameda County; Nicasio and Point Reyes, Marin County; Sherwood, Mendocino County; Eureka, Fair Oaks, Arcata and Trinidad, Humboldt County. Merriam (1895, p. 79) records specimens from the following additional localities: Crescent City, Del Norte County; Boulder Creek, Santa Cruz County; Morro and San Luis Obispo, San Luis Obispo County. The latter two are the southernmost record stations for the species. The species has also been recorded from Portola and La Honda, San Mateo County (Allen, 1896, p. 269); and I have examined specimens (in collection of C. P. Streator) taken at Santa Cruz, Santa Cruz County. Elliot (1907, p. 471) records specimens, supposedly of this form, from: Mount Hamilton, Santa Clara County; Petaluma, Sonoma County; Mendocino, Mendocino County; also from five localities previously enumerated.

In consideration of the above data it would appear that *Sorex montereyensis* is, within its well-defined habitat, abundant, and more easily trapped than any others of the shrews of west-central California.

Sorex montereyensis mariposae, ssp. nov.

Yosemite Shrew

Type.—Skin and skull, ♀ young adult; no. 12,979, Mns. Vert. Zool.; Yosemite Valley at 4,000 feet altitude, Mariposa County, California; May 27, 1911; collected by J. and H. W. Grinnell; orig. no. 673.

Diagnostic characters.—Closely similar to *Sorex montereyensis montereyensis* in all characters; differs from this form in paler, distinctly grayer coloration.

Coloration.—In summer pelage, above hair brown mixed with drab gray; ears and top of head clear hair brown; lower surface drab gray with a silvery sheen; fur at base slate-gray; tail bicolor, drab above, dull white beneath; feet drab; whiskers plumbeous.

Measurements of type.—Total length 121 mm., tail vertebrae 51, hind foot 14, greatest length of skull 19.3, width of braincase 9.3, height of braincase 5.5.

Range.—Specimens are at hand from the following localities, all in the Transition zone of the central Sierra Nevada: Dutch Flat, 3,400 feet altitude, Placer County; Glen Alpine Springs, 7,000 feet, Eldorado County; Yosemite Valley, 4,000 feet, Mariposa County. There is also in the Museum a specimen (no. 11347) from Parker Creek, 5,500 feet, Warner Mountains, Modoc County, California, which is for the time being referred to the subspecies here characterized.

Sorex pacificus Baird

Pacific Shrew

Original description.—*Sorex pacificus* Baird, *in* Coues (1877), p. 650.

Type locality.—Fort Umpqua, mouth of Umpqua River, Douglas County, Oregon.

Coloration.—Both above and below rich warm prout's brown inclining towards cinnamon-rufous. The brightest color is exhibited by August specimens; in winter pelage the shade is darker, approaching seal brown dorso-posteriorly. In both pelages the lower surface is slightly paler than the dorsal; fur at base, blackish slate; the tail is seal brown, unicolor; feet (dried), wood brown; whiskers plumbeous.

Cranium.—Very large and massive; braincase nearly straight-topped in lateral profile, relatively flattened. See figure 6 and table of cranial measurements.

Measurements.—Forty-five specimens, from Humboldt County, measure, average and extremes: Total length 146 mm. (135–159), tail vertebrae 61.6 (50–70), hind foot 17.5 (16–19).

Range.—Upland riparian association in the Transition zone of the northern humid coast belt; not so far discovered south of San Francisco Bay, and not numerous south of the Humboldt Bay region. The southernmost record station is Point Reyes, Marin County, whence Merriam (1895, p. 87) reports two specimens. Elliot (1907, p. 472) records specimens from Mendocino, Mendocino County; Requa and Crescent City, Del Norte County. The series in the California Museum of Vertebrate Zoology comes altogether from Humboldt County: Eureka, Fair Oaks, Ferndale, Cuddeback, Arcata, and Trinidad.

NOTE ON THE PALUSTRINE FAUNAS OF WEST-CENTRAL CALIFORNIA

With the descriptions of the two shrews named in the present paper, two more species are added to the list of the higher vertebrate animals known to be restricted to the marshes of west-central California. These palustrine forms are enumerated below with salient facts as to relationships and distribution.

Birds

1. *Geothlypis trichas sinuosa* (Salt Marsh Yellowthroat).

Inhabits the marshy borders of San Francisco Bay both around the south arm and along the north side; occurs also locally away from salt water, as at Lake Merced. Characterized by small size and dark coloration. Nearest relative is *G. t. occidentalis* of the riparian and fresh-water palustrine associations of central and northern California generally.

2. *Passerculus sandwichensis bryanti* (Bryant Marsh Sparrow).

Inhabits open salicornia flats on the salt marshes all around San Francisco Bay, and adjacent low-lying pastures; ocurs also on the salicornia marshes back of Monterey Bay. Characterized by small size and dark coloration. Nearest relatives are an unnamed form on the marshes of Humboldt Bay, *P. s. nevadensis* of the alkali sinks in the Great Basin region, and *P. beldingi* of the coastal salt marshes of southern California.

3. *Melospiza melodia pusillula* (Salt Marsh Song Sparrow).

Inhabits exclusively the salicornia flats of the salt marshes bordering the south arm of San Francisco Bay, from South San Francisco around to West Berkeley. Characterized by small size, black streaking, grayish "ground" color, and yellow suffusion beneath. Nearest relative, *M. m. santaecrucis* of the fresh water riparian association of the uplands immediately adjacent.

4. *Melospiza melodia samuelis* (Samuels Song Sparrow).

Inhabits exclusively the salicornia association of the salt marshes on the north side of San Francisco Bay, from Larkspur to Vallejo. Characterized by small size and dark coloration. Nearest relative, *M. m. gouldi* of the fresh water riparian associations of the immediately adjacent uplands.

5. *Melospiza melodia maxillaris* (Suisun Song Sparrow).

Inhabits exclusively the marshes west of the confluence of the Sacramento and San Joaquin rivers, centering in the Suisun Bay region; occurs west to Benicia and Port Costa. Characterized by great size and exceedingly dark coloration. Nearest relatives, *M. m. mailliardi* and *M. m. heermanni*, of the San Joaquin River region east and south.

6. *Rallus obsoletus* (California Clapper Rail).

Inhabits the salt marshes of the south arm of San Francisco Bay. Characterized by large size and pale tone of coloration. Nearest relative, *Rallus levipes* of the salt marshes of the coast of Southern California.

(Should close study be accorded the Marsh Wrens (*Telmatodytes*) of the San Francisco Bay marshes, it is not improbable that differences would be found. This Museum still lacks material for such inquiry.)

Mammals

1. *Reithrodontomys raviventris* (Red-bellied Harvest Mouse).

Inhabits the salicornia flats on the salt marshes surrounding the south arm of San Francisco Bay, at least from Redwood City around to Melrose. Characterized by small size and dark colors, reddish beneath. Nearest relative, *R. longicauda* of the fresh water riparian and meadow associations of the immediately adjacent uplands.

2. *Reithrodontomys halicoetes* (Tidal Marsh Harvest Mouse).

Inhabits the salt marshes on the north side of San Francisco Bay, at least at Petaluma, and the brackish marshes of Suisun Bay from Cordelia Slough to Grizzly Island. Characterized by great size and dark coloration. Nearest relative, *R. longicauda* of the fresh water riparian and meadow associations of the adjacent uplands on all sides.

3. *Microtus edax* (Tule Meadow Mouse).

Inhabits the marshes of the Suisun district, from Cordelia Slough eastward to the confluence of the Sacramento and San Joaquin rivers, and up each of these streams for an unknown distance. Characterized by great size and dark coloration. Nearest relative, *M. californicus* of the adjacent uplands on all sides.

(The meadow mouse of the marshes on the north side of San Francisco Bay resembles *edax* in slight degree, but has not so far been recognized as separable from *californicus*. The meadow mouse of the marshes of the south arm of San Francisco Bay is at present considered the same as *californicus* of the surrounding uplands.)

4. *Sorex halicoetes* (Salt Marsh Shrew).

5. *Sorex sinuosus* (Suisun Shrew).

These two species are dealt with in detail on preceding pages.

INFERENCES

The foregoing data point towards the existence of three differentiation areas in the salt or brackish marshes of the San Francisco Bay region, each cut off by barriers (to palustrine animals) from both of the other two. These areas are: (1) the marshes bordering the south arm of San Francisco Bay; (2) the marshes along the north side of San Francisco Bay (including

San Pablo Bay); and (3) the marshes lying east of the Straits of Carquinez and extending thence to the confluence of the Sacramento and San Joaquin rivers, hence including the Suisun Bay district.

The first-named area of differentiation is wholly cut off from the second by the open water-way leading from the Straits of Carquinez out through Golden Gate. The third area of differentiation centering in the Suisun marshes, is cut off from both of the other areas by the ranges of hills which rise abruptly from the shore on either side of the Straits of Carquinez, there being thus an extensive littoral interval lacking any trace of palustrine conditions.

Attention to the eleven species of birds and mammals above enumerated shows allotment by areas, as follows: (1) South arm of San Francisco Bay, six species: *Geothlypis t. sinuosa, Passerculus s. bryanti, Melospiza m. pusillula,* Rallus obsoletus,* Reithrodontomys raviventris,** and *Sorex halicoetes.** The four species starred are found only in this area. (2) North side of San Francisco Bay, four species: *Geothlypis t. sinuosa, Passerculus s. bryanti, Melospiza m. samuelis,* Reithrodontomys halicoetes.* Of these only the single species starred is restricted to this area. (3) Suisun district, five species: *Passerculus s. bryanti, Melospiza m. maxillaris,* Reithrodontomys halicoetes, Microtus edax,* Sorex sinuosus.** The three starred species are confined exclusively to this area.

It will be observed that the mammals show more restriction than the birds; which is to be expected from the relative abilities in the two classes to transgress geographic barriers. It is further to be seen that the first and third differentiation areas have produced the greatest number of, and most divergent, types, while the second area is of smaller size and is approximately intermediate in location; both of these contingencies may account for its poverty in species and ineffectiveness, as a center of differentiation.

The most interest attends those cases where the salt marsh has produced races distinct from the supposedly parent stock of the immediately adjacent uplands, *no obvious barrier being interposed.* Most pertinent in this regard are the following seven

species: *Melospiza m. pusillula*, *Melospiza m. samuelis*, *Melospiza m. maxillaris*, *Reithrodontomys raviventris*, *Reithrodontomys halicoetes*, *Microtus edax*, *Sorex sinuosus*. In each case the habitat of the upland near relative adjoins that of the salt or brackish marsh form, the palustrine conditions being in some cases actually confluent from fresh to salt water.

It would appear that we find here a form of isolation not referable to the ordinary geographic kind, but dependent upon some factor other than separation by long distance or interposition of impassable barriers. There seems to be existent a strong preferment on the part of individuals for the fresh-water conditions on the one hand or the salt-water on the other; and this preferment is a *racial trait*.

The halophilous species of all three differentiation areas show community in one character: depth of color, that is, quantity of pigmentation, as compared with their near relatives. Only one exception presents itself, that of the clapper rail. In matter of size, all four of the species of the Suisun district (3) are giants as compared with their near relatives; while around the south arm of San Francisco Bay (1) four of the palustrine species are distinctly dwarfs. The only obvious allocation of cause and effect is shown in the association of the dark coloration with halicoetic habit. But we find without exception that the *blackest* species are in the Suisun area where the water of the marshes is least salt!

These facts are called to the attention of students of speciation with the hope that parallels may be reported from elsewhere. Through the cataloging of instances of such interrelationships, especially where conspicuous physical peculiarities of the environment are involved, it is to be confidently expected that much clearer insight is to be gained into the behavior of species in nature.

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WITH REMARKS UPON THE BEHAVIOR OF GEOGRAPHIC RACES ON THE MARGINS OF THEIR HABITATS

BY
J. GRINNELL AND H. S. SWARTH

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INTRODUCTION

The first field work formally undertaken by the Museum of Vertebrate Zoology, after its inauguration in March, 1908, was centered in the San Jacinto Mountains of southern California. The contiguous regions on both the desert and Pacific sides were included in the explorations. This program was settled upon in part because this particular area remained at that time the least known part of southern California as regards its vertebrate fauna, and in part because there were likely to be presented here in accentuated degree peculiar distributional features dependent upon the great altitude of the mountain itself and the close juxtaposition on either hand of the sharply contrasted faunas of the desert and coast regions.

Furthermore, there were already available the collections and information resulting from the senior author's work in the San Bernardino Mountains, since published (Grinnell, 1908). This afforded a basis for a systematic plan of action looking towards verification of certain previously entertained hypotheses.

During the five years' interim, from the date of concluding the San Jacinto field work until the final compilation of the present report, much pertinent data has been secured from studies of related areas. These additional sources of information have enabled us to interpret the distributional problems concerned with the San Jacinto area as we could not have done otherwise. All of this contributory faunistic work, as well as the main undertaking, has been made possible through the continued financial support provided by Miss Annie M. Alexander, who has thus shown in an effective way her belief in the ultimate value of efforts expended in this line of scientific inquiry.

The San Jacinto Mountains form a sharply segregated section in the series of high ranges which cut off the fertile coast valleys of southern California from the arid deserts of the interior. The San Bernardino Mountains lie directly to the northward, with the gap formed by San Gorgonio Pass between. To the southward is the Santa Rosa range, separated but slightly from the main San Jacintos, and farther south are various smaller mountain chains (see profile, plate 7).

Practically all the drainage on the western side of the San Jacintos goes into the cañon formed by the San Jacinto River. From Hemet Lake down, this stream occupies a rough, narrow and rather steep cañon; above the lake there is no running stream, and the cañon opens out into the broad, level Hemet Valley, extending nearly to Vandeventer Flat. On the east side of the range is Palm Cañon extending along almost the entire desert base of the mountains and emptying onto the Colorado Desert near Palm Springs; at the south it heads just below Vandeventer Flat. The latter point is thus at one apex of a rudely defined triangle, the three sides of which are formed by San Jacinto River Cañon, Palm Cañon, and San Gorgonio Pass. The main mass of the San Jacinto Mountains, including all the higher parts of the range, is contained within this triangle.

In the course of our season's work practically the entire outline of this triangular area was traversed, and many collecting stations were established within its borders. Some work was done also at points outside the triangle, for example, in the Santa Rosa Mountains.

During the summer of 1908 two parties engaged in the field exploration here concerned. The two authors of the present paper entered the region from the west, and began work on the Pacific side of the mountain. Our stations were as follows:

Hemet, May 18
Kenworthy, May 19 to May 25, June 2 to June 11
Dos Palmos Spring, May 25 to June 2
Palm Cañon, June 11 to June 18
Carrizo Creek, June 18 to June 23
Garnet Queen Mine, June 25 to June 28
Santa Rosa Peak, June 28 to July 1
Strawberry Valley, July 3 to July 19
Tahquitz Valley, July 19 to August 5
Hemet Lake, August 6 to August 16
Thomas Mountain, August 16 to August 20
Carrizo Creek, August 22 to August 27
Vallevista, August 29 to September 5

Only the junior author remained in the field until the last indicated date. The senior author left July 31; and Harry E. Wilder, of Riverside, took his place August 15. During the last visit to Carrizo Creek, the party was further augmented by

George Ferguson, of Colton, and Harry G. Rising of Los Angeles. Although in the mountains merely for pleasure, they rendered valuable assistance. During June the writers were accompanied by L. Hollister Jones, as assistant, and during June and July by Fordyce Grinnell, Jr.

Walter P. Taylor and Charles H. Richardson, Jr., with Charles L. Camp as assistant during a portion of the season, penetrated the region from the north. Their collecting stations, with the time spent at each, are as follows:

Cabezon, May 1 to May 25
Snow Creek, May 25 to June 3
Whitewater, June 3 to June 6
Banning, June 6 to June 16
Schain's Ranch, June 16 to June 30
Fuller's Mill, June 30 to July 5
Round Valley, July 6 to July 12

The party entering upon the mountains from the west traveled to Kenworthy by wagon. From this point as a base, pack animals were used to reach the stations in Palm Cañon and the Santa Rosa Mountains. Strawberry Valley, reached by wagon, served as a starting point for pack trips to Tahquitz Valley, Round Valley, and the summit of San Jacinto Peak. In San Gorgonio Pass the Southern Pacific railroad was used to reach the series of collecting stations nearby. From Banning, Schain's Ranch and Fuller's Mill were reached by wagon. The latter point was used as a base from which pack trips were made to higher parts of the mountains.

The objects of all this field work were to gather collections of mammals, birds and reptiles, and to record all information practicable to obtain in regard to them, especially that in line with problems in distribution. The specimens obtained by the Museum parties number: mammals, 1099; birds, 1533; sets of birds' eggs with nests, 15; reptiles, 437.

Information based upon mammals obtained by the senior author at Palm Springs in December and January, 1903 and 1904, and February 9 to 13, 1912, is also included in the present report; but inasmuch as the birds observed at these times have already been published upon elsewhere (Grinnell, 1904 a, pp. 40–45; 1912 b, p. 154) they are omitted from this account. They are, however, taken into consideration in the discussion of the

composition and relationships of the fauna of the San Jacinto area. This will explain the mention of species of birds which are not formally listed in the body of the report beyond.

A circumstance which materially aided our work with the vertebrate animals was the previously accomplished *Botanical Survey of San Jacinto Mountain*, carried on and reported upon by Harvey Monroe Hall (1902). Not only was a guide to the flora of the higher parts of the San Jacintos thus made available, but an admirable exposition of the life zones of the area left little need for the expenditure of our own efforts in this direction. In our present contribution it is presumed that the reader will have already familiarized himself with Professor Hall's invaluable paper; we have avoided repetition of everything already set forth satisfactorily in published literature.

DESCRIPTIONS OF LOCALITIES

Kenworthy and Hemet Valley

Kenworthy is an abandoned mining camp near the upper end of Hemet Valley, at an altitude of 4500 feet. Hemet Valley is broad and nearly level, from one to two miles wide, and extends from Hemet Lake nearly to Vandeventer Flat, a distance of about ten miles. Thomas Mountain hems it in on the southwest, while on the northeast are Hemet Peak and the series of ridges leading down from Tahquitz Peak. The floor of the valley is covered mostly with sage (*Artemisia tridentata*) and widely scattered yellow pines, while at irregular intervals there are grass-covered areas. The largest of these tracts of meadow land is at the head of Hemet Lake and on the adjoining Thomas Ranch; there are other smaller meadows at Kenworthy and Vandeventer Flat. The hills on both sides are covered with Upper Sonoran chaparral: greasewood (*Adenostoma fasciculatum* and *A. sparsifolium*), manzanita, ceanothus and scrub oak. The slopes to the northeast of Kenworthy, culminating in Hemet Peak, are extremely rocky, and the brush is more sparse, with scattering Coulter pines and a few four-leaf piñons. The hills west of the valley are more thickly brush-covered, with many dense clumps of scrub oak at their base. Toward Vandeventer Flat these oak

thickets are more numerous and cover larger areas, in many places extending out upon the floor of the valley. At Vandeventer Flat there are many large-sized live oaks. The scaly-barked, reddish-colored *Adenostoma sparsifolium* is about the most conspicuous feature of the chaparral of this region, while the fact that it was always found in association with the gray vireo (*Vireo vicinior*) brought it forcibly to our notice. The ranges of the two in the San Jacinto Mountains were found to be absolutely the same (see p. 291).

There are settlements in Hemet Valley: at the Thomas Ranch, a large and prosperous ranch just above Hemet Lake; at Kenworthy, where there are several small ranches and the mines above mentioned, the latter abandoned, but mills and other buildings still standing; and at Vandeventer Flat, a single ranch.

We established a base camp at Kenworthy on May 19, making it our headquarters until July 5. Collecting was prosecuted in the vicinity from May 19 to 25 and from June 2 to 11.

Dos Palmos Spring

On the desert slope of the Santa Rosa Mountains, at 3500 feet altitude. Two palm trees in a narrow, rocky gulch mark the source of a trickle of water which flows over the rocks for a few hundred yards and sinks in the sand where the cañon opens out upon the more level mesa. This station, below the belt of piñon and sage, is about on the upper margin of the Lower Sonoran zone, with an abundance of typical desert plants and animals. The rolling mesa of hard gravel or sand, with occasional rocky outcroppings, traversed by many sandy washes and gulches, supports a fairly dense growth of brush, creasote, several species of cactus, pluchea, yucca, and other plants of low zone (see pl. 10, fig. 1). Along the water courses are dense thickets of desert willow (*Chilopsis*), mesquite and catclaw; in several rocky gulches, clumps of two or three palms; and on the stony hills some two miles below the spring the uppermost limit of the ocotilla is reached.

Two miles to the northward Black Hill, a conspicuous landmark, rises abruptly from the mesa, a jumbled pile of loose, black rocks, almost destitute of vegetation. The stream flowing from

Dos Palmos Spring, Carrizo Creek, circles the western base of this mountain, the rocky formation here once more forcing the water to the surface.

About three miles west of the spring lies the tremendous gorge of Deep Cañon, the walls of which drop from the surrounding mesa to a depth of from five hundred to a thousand feet, and so abruptly that from a distance of a few hundred yards on the plain above, there is little or no indication of the break in the topography. Throughout most of the year there is a fairly large stream in the cañon, but no grass or underbrush. A few solitary cottonwoods and ash trees are scattered along the creek.

This region was reached from Kenworthy by means of pack animals. Camps were established here from May 25 to June 2, June 18 to 23, and August 22 to 27. Heavy rains fell in the interval between our second and third visit, swelling the stream in Deep Cañon and bringing up an abundance of bunch grass everywhere on the mesa.

Palm Cañon

Palm Cañon extends for its entire length, some twelve or thirteen miles, along the eastern base of the San Jacinto Mountains, serving as the dividing line between that range and the Santa Rosa Mountains. The cañon is broad and open, affording little shelter from the hot glare of the desert sun, and the stream of water it contains is unpleasantly warm and brackish.

Between June 11 and 18 three camps were established in this region: at the mouth of the cañon (about 700 feet altitude), near "Little Paradise" (2500 feet), and at about 3000 feet. Our reconnoiters did not include a stretch of about five miles immediately below the head of the cañon at Vandeventer Flat.

The most conspicuous feature of the country at our lowest camp was the forest of Washington palms (see pl. 9, fig. 2), which extends in a narrow line along the stream, from the mouth of the cañon (700 feet) up to about 1000 feet. There was almost a swamp of cat-tails and willows along the stream, while the banks and nearby hillsides were covered with dense thickets of mesquite,

catclaw, screwbean, and arrowweed, with an occasional cottonwood along the creek.

Farther up the cañon, at our higher camps (2500 to 3000 feet), we were above the region of palm trees, and in the agave belt. Great numbers of these plants were in full bloom in June on the sunny sides of the surrounding ridges, especially east of the stream, while the shaded slopes were grown up with a rather scattered growth of yuccas, junipers, and scrub oaks. Along the stream were willow, desert willow (*Chilopsis*), and a few cottonwoods.

At the termination of our stay in Palm Cañon, we traveled directly to Dos Palmos, leaving Palm Cañon at "Little Paradise," ascending a draw to Potrero Spring, skirting Asbestos Mountain on the west and south, and then crossing the northern portion of Piñon Flat. At the summit of the ridges the north sides are scantily clothed with piñon and scrub oak, the south sides and flats down to 2500 feet with juniper, agave, a species of *Prunus*, catclaw, yucca, several species of cactus, and other desert plants.

Garnet Queen Mine

On the western slope of Santa Rosa Mountain, at 6000 feet altitude. The mine is abandoned, and the old cabin pertaining to it proved to be a convenient place at which to camp. This was in a steep and rather narrow cañon, at the extreme lower edge of the Transition zone, which is here very sharply defined against the Upper Sonoran just below, the change from greasewood-covered Upper Sonoran hills to pine-timbered Transition being made within a distance of about one hundred feet. North of camp was a chaparral-covered ridge, brushy down to within a hundred yards of the cañon bottom, while the south slope (north facing) was timbered to the top, the usual effects of such slope exposure emphasized by the cutting off of the dry, hot desert air-currents by the first mentioned ridge. Some Transition zone plants at this point were the many incense cedars and silver firs, a few yellow pines and sugar pines, many golden oaks, willows, *Amorpha*, *Ribes*, and *Symphoricarpus*. The region was prolific in bird and mammal life, as well as in insects. In

many instances Upper Sonoran and Transition species of birds could be seen or heard at the same time at the sharply defined boundary between the two zones; but each usually remained well within its own zone. We remained here from June 25 to June 28.

Santa Rosa Peak

Our camp at this point, two hours' climb from the Garnet Queen Mine, was in a gulch about half a mile north of the summit of Santa Rosa Peak, and at an altitude of about 7500 feet. We found here a small spring, barely sufficient for our needs, but the only water anywhere about the summit of the mountain. Collecting was carried on all along the ridge between Santa Rosa and Toro peaks. This divide, the highest part of the Santa Rosa Mountains, runs east and west. A slightly higher eminence (Santa Rosa Peak, 8046 feet) is at the west end, and a still higher one (Toro Peak, 8705 feet), is about three miles away at the east end. On the south side of the ridge the slopes are steep, down to the chaparral-covered foothills; on the north side much less so down to the Piñon Flat country. The summit of the ridge and the northern slope down to about 6500 feet, on an average, are well timbered with large trees, the forest being usually open, with very little underbrush. The trees are sugar pine, yellow (or Jeffrey) pine, silver fir and incense cedar. On the summit of Toro Peak, and down two hundred yards from the top, there are stunted limber pines (*Pinus flexilis*), but firs and Jeffrey pines also extend to the summit.

On the whole we considered the entire timbered area of the Santa Rosa Mountains as Transition, with extreme Upper Transition on Toro Peak. The limber pine seen at the latter point was the only higher zone plant observed, and there were none but Transition birds and mammals encountered. A possible exception to this statement was afforded by the observation of two Clarke nutcrackers; but at this season of the year these may well have been wanderers from the nearby San Jacinto Mountains. In fact the species was also encountered in the sagebrush at Kenworthy.

We were on Santa Rosa Mountain from June 28 to July 1.

Strawberry Valley

We had two base camps at this point, the first, about half a mile above the "Bungalow" and at the edge of the cluster of buildings forming the Idyllwild summer resort, the second at some abandoned ranch buildings about a mile farther up the valley. The floor of the valley, at about 5500 feet elevation, a broad, gently sloping expanse, is covered with a scattering growth of pines, cedars, and black and golden oaks, lumbering operations of former years having removed a large portion of the forest. The park-like center of the valley is covered almost everywhere with a dense growth of brakes, with occasional meadows interspersed; along the two streams are many alders and some willows, with a dense tangle of gooseberry, rose, and rhododendron bushes beneath; and the more broken ground at the base of the surrounding slopes is covered with large tracts of chaparral, clumps of manzanita and ceanothus, interspersed with open spaces dotted with golden oaks and occasional yellow and sugar pines (see pl. 8, fig. 2).

We were in Strawberry Valley from July 3 to 19.

Tahquitz Valley

Composed of several rather extensive meadows, at about 8000 feet elevation. In the bottom of the valley are the boggy meadows drained by numerous small streams, grass-covered, with borders of brakes, and in places with large tracts of skunk cabbage (*Veratrum*). Along the streams and in places along the margins of the meadows, are thick clumps of willows and many gooseberry bushes. Above the meadow land, on the drier surrounding slopes, and on the several low ridges intersecting the valley, are extensively timbered areas. The prevailing trees are Jeffrey pine and silver fir, with some lodge-pole pine in places and with much chaparral, mostly chinquapin and buckthorn. On the higher, exposed rocky ridges leading up to Tahquitz Peak the brush is much more dense, and the timber is stunted and scattering, while on the north side of Tahquitz Peak there are a good many limber pines (see pl. 8, fig. 1; pl. 9, fig. 1).

The valley as a whole is high Transition, with a decided tinge of Canadian in the meadows. Birds were abundant here, both as

to individuals and species. In many instances the breeding species were not the same as those encountered in Strawberry Valley, two thousand feet lower. These more boreal forms were Stephens sparrow, Williamson and red-breasted sapsuckers, golden-crowned and ruby-crowned kinglets, and Lincoln sparrow; but besides these there were the hordes of birds of the lower zones beginning the late summer movement into the high mountains. Such species as the Parkman and San Diego wrens, Cassin vireo, and black-throated gray warbler (to mention but a few) were abundant; while occasionally one or two Bell sparrows and black-chinned sparrows, black phoebes, Bullock orioles, and even meadowlarks, were encountered. We were camped in Tahquitz Valley from July 19 to August 5.

Hemet Lake

At the extreme lower end of Hemet Valley. The lake, lying between lateral ridges, is a mile and a half long and a quarter of a mile across, and was formed artificially by the building of a dam, about two hundred feet high, across the narrow cañon at the outlet of the valley. Lying between Thomas Mountain on the south, and Bald Mountain on the north, it is the natural reservoir and outlet of a vast surrounding area. At the lower (western) extremity of the lake the hills abut closely, the country is rough and brushy, and the shores are steep and rocky; but at the eastern end the valley opens more widely, and in the shallow water of the lake there is a thick growth of tules. Immediately above this end of the lake are stretches of marshy ground, rising gradually to the dry meadow land beyond.

Many large yellow pines surround the lake and dot the meadows above. The adjacent hill sides are densely covered with chaparral, of the same character as that upon the Kenworthy hills; and over the valley southeast of the lake there is a dense growth of sagebrush. On Bald Mountain, to the northward, are many large golden oaks.

The presence of this large body of water in an otherwise rather arid region accounts for the presence here of numerous species of birds and some mammals which do not find congenial surroundings elsewhere in these mountains. We did not visit

the lake at the right time to ascertain what birds were breeding there, but numbers of migrating ducks and waders were seen during our stay. Old nests, possibly of herons, occupied dead trees about the water's edge.

The lake and much of the surrounding country is the property of the Hemet Land Company. The owners allow no camping or shooting on their holdings, thus affording refuge for species of birds which have no other place to turn to in the region, and which were evidently using the lake as a stopping place in their passage over the mountains.

We spent ten days at this point, August 6 to 16.

Thomas Mountain

The row of hills bounding the south side of Hemet Valley, from Hemet Lake to Kenworthy, culminates in a high ridge, Thomas Mountain, about three miles south of the lake. The summit, 6823 feet altitude, is reached by a trail leading from the wagon road in Hemet Valley. Dense chaparral clothes the mountain sides nearly to the top, where the country opens out into a series of park-like glades. This stretch, about a mile and a half in length, is grown up with yellow pines and cedars, some Coulter pines at the edge of the brush, and some firs in the gulches at the heads of the cañons, with an occasional clump of large golden oaks. Extensive grassy flats and side hills furnish abundant horse feed. The south-western slope of the ridge is even more brushy than the one we ascended, the chaparral extending quite to the summit of the ridge, and in many places growing to such a height as to cut off all view of Coahuila Valley below.

The drawback to the place is the absence of water, a small spring at the southern end of the plateau, where we camped, and a still smaller one at the northern end, being the whole supply. The gulches seaming the hillsides, all exceedingly steep, are in late summer absolutely dry.

The level summit of the ridge appears to be unalloyed Transition, an area of small size, but sharply defined against the surrounding chaparral, and containing many Transition birds and mammals.

Collecting was carried on at this point from August 16 to 20.

Vallevista

Our camp at this point, the one Lower Sonoran station worked on the Pacific side of the mountains, was at the base of the hills, and at the edge of the wash extending from Bautiste Creek, about a mile southwest of the little settlement of Vallevista. Here was an extensive area covered with the Lower Sonoran chaparral once so characteristic of the southern California valleys, and now so nearly disappeared through the clearing and cultivation of the land. The gravelly mesa for an area several miles square was grown up with disconnected but luxuriant patches of brush, composed largely of sumac, white sage, wild buckwheat, elder and cactus, with an occasional cottonwood tree, and, toward the hills, a few live oaks. From the edge of this brush land stubble fields extended for miles, to give place in their turn to the extensive orchards about the towns of Hemet and Vallevista.

This proved to be an interesting spot in several respects, for besides being the only Lower Sonoran locality that we visited on the west side of the San Jacinto Mountains, and hence supplying much needed data regarding the distribution of animal life in the region, we found here certain species of mammals, birds, and reptiles characteristic of the same zone on the desert side, but, except in rare and isolated instances, not known to range west of the mountains.

We remained here from August 29 to September 5.

Cabezon

At the northern base of the San Jacinto Mountains lies San Gorgonio Pass, which joins the low coastal valleys with the desert plains to the eastward and separates the San Jacinto and San Bernardino mountain ranges. As it is one of the few low gaps piercing the mountains, it is a great highway for migrating birds passing through the region; and while, from its low elevation, it serves as a point of junction for the widely different Sonoran faunas of the desert and coast regions, it is also an effective barrier between the higher zones of the mountains on either side. These various considerations made it desirable that careful ob-

servations be made and specimens acquired from the base of the mountains bordering the pass, and four camps were therefore established in this region, at Cabezon, Snow Creek, Whitewater and Banning. These were all on the desert slope. The San Diegan fauna and flora extend over the summit of the divide well down towards the desert, and it was the region of blending with the desert fauna that we wished especially to explore.

The first camp was at Cabezon. The railroad station of this name, about twelve miles from Beaumont at the divide, lies about midway between the summit of the pass and the floor of the desert. Camp was established in the foothills, a mile and a half south of the railroad, at an elevation of about 1700 feet. The precipitous slopes at this end of the mountains are clothed to their bases with the dense Upper Sonoran chaparral characteristic of the Pacific side of the range, while the cañons are steep and narrow, containing comparatively few trees. This association carries with it many of the birds and mammals of the Pacific slope, these in most cases extending quite to the base of the hills, but not out upon the floor of the valley below. This latter area, also densely covered with brush and cactus, but of Lower Sonoran forms, is inhabited by a few desert species of animals though many of the most typical do not ascend this high in the pass. The vegetation here is of the character of the Lower Sonoran washes of the San Diegan district rather than that of the Colorado Desert, but some desert plants, such as the mesquite, were also found in small quantity.

Field work was prosecuted at Cabezon from May 1 to 25.

Snow Creek

Snow Creek is an extremely precipitous cañon extending due north from the rocky summit of San Jacinto Peak and emptying onto the floor of the desert near Whitewater, about seven miles east of Cabezon. Camp was established at the mouth of the cañon, at about 1500 feet elevation. San Jacinto Peak, towering above, at an altitude of 10,805 feet, was in an air line less than five miles distant, the mountain sides here being little less than a series of precipices. A narrow line of trees bordered the creek, mostly alder, with an occasional cottonwood. Away

from the creek the cañon was sparsely brush-covered and strewn with boulders and huge rock piles, being little more than a storm cone up to about 2000 feet, above which altitude it abruptly narrowed.

The vegetation at this station was more typically that of the desert than it was at Cabezon. Such desert plants as creasote, mesquite and catclaw grew in some profusion, while at the mouth of a cañon just south of Snow Creek there was a small bunch of palm trees. The latter afforded our westernmost record station for this plant. Typically desert birds and mammals were also more numerous than they had been found to be a few miles farther up the pass. In Snow Creek Cañon above the desert floor Upper Sonoran species extended downwards to the limit of chaparral, as at other points along this slope of the mountains.

Camp was maintained at the mouth of Snow Creek from May 25 to June 3.

Whitewater

From June 3 to 6 collecting was prosecuted at Whitewater, a station on the railroad about two and a half miles northeast of the mouth of Snow Creek, and at an altitude of 1130 feet. This point is the westernmost extension of the rolling sand-dune-covered country characteristic of the adjacent portion of the Colorado Desert, and here were found such exclusively desert species as *Dipodomys d. deserti*, *Dipodomys m. simiolus* and *Citellus t. chlorus*.

San Gorgonio Pass is noted as a region of heavy winds, and Whitewater is exposed to the full force of the gale from the west, more, perhaps, than any other portion of the pass.

Banning

Camp was pitched in the San Jacinto foothills about two miles southeast of the town of Banning and at an elevation of 2300 feet. The lower parts of the mountains at this point were covered with a dense growth of typical Upper Sonoran chaparral, mostly greasewood, with a good deal of white sage, some poison oak and elder, and a few scattering live oaks. The brush in

the valley below was largely composed of catclaw. Banning lies at the eastern end of the great grain and fruit growing region which occupies all of the center of San Gorgonio Pass to the westward. At this point the orchards and grain fields of established cultivation cease, and east of here the desert conditions prevail, unbroken except for sporadic attempts at farming and for occasional limited oases at the mouths of cañons.

But very few desert animals were found this far to the westward and in complementary fashion such typical San Diegan species as valley quail, Pasadena thrasher, western lark sparrow and wren-tit among birds, and *Reithrodontomys m. longicauda*, *Perodipus a. agilis*, and *Citellus b. fisheri* among mammals, occurred in great abundance. Of several widespread species of mammals having different subspecies on the coast and desert sides of the range, such as *Neotoma intermedia*, *Perognathus panamintinus* and *Perognathus fallax*, Banning specimens proved to be intermediate in characters, indicating that this was approximately on the line of mergence of the desert and coast faunas.

Collecting was carried on at Banning from June 6 to 16.

Schain's Ranch

The trip from Banning to Schain's Ranch, about eleven miles, was made over a wagon road. Banning, at an elevation of 2200 feet, lies at the lower edge of the Upper Sonoran life zone, and Schain's Ranch, 5000 feet, at its extreme upper limit. The road between the two points winds through chaparral-covered hills for most of the distance, except at Poppet Flat, 4000 feet, where a ranch is located. Here there is a great deal of open ground, extensive fields and meadows, dotted with large live oaks. Above this point buckthorn and manzanita begin to replace the greasewood thickets of the lower hills.

Camp was established at the ranger's cabin, about a quarter of a mile distant from Schain's Ranch. This was situated on the summit of the broad ridge marking the divide between the San Gorgonio Pass and San Jacinto Valley drainages of the mountains. In every direction below camp extended Upper Sonoran chaparral; a short distance above there was a clump of yellow pines, and farther up, Transition pine forests covered

the hillsides. Immediately about the cabin there were small areas of grass and flower-covered meadows. The majority of the birds and mammals collected here were of Upper Sonoran species, the Transition species, though but a short distance away, seldom straying down this far.

This camp was occupied from June 16 to 30.

Fuller's Mill

This station, about midway between Schain's Ranch and Strawberry Valley, was at the same elevation as the latter point, 6000 feet, and well within the Transition Zone. Fuller's Mill, on the western slope of the range, lies in a huge amphitheater, surrounded by high ridges except on the southwest. The streams all drain into the north fork of the San Jacinto River.

The region is, in its general characteristics, much like Strawberry Valley, being fairly level and grown up with open woods, with little underbrush. The forest trees are largely yellow pine, white fir, incense cedar, Coulter pine, and black and golden oaks.

It was at this point that the party ascending this section of the mountains first encountered such Transition species as the white-headed woodpecker, mountain chickadee, slender-billed nuthatch, Audubon warbler, and others found commonly from this altitude upward. Camp was maintained here from June 30 to July 5.

Round Valley

This little valley, the highest point at which a camp was established, 9000 feet, lies at the east base of San Jacinto Peak, the streams draining eastward down the exceedingly steep slopes above Palm Springs. It is timbered chiefly with lodgepole pine, though there is a good deal of fir and Jeffrey pine on the dry, rocky ridges to the northward, while the higher surrounding slopes are clothed with chinquapin, manzanita, and buckthorn. The center of the valley is occupied by a small cienaga, a few acres of grassy marsh bordered by veratrum patches and willow thickets.

To the northwest rises San Jacinto Peak, 10,805 feet, the highest point in the range. Ascending the mountain, limber pine extends, though in dwarfed or prostrate form, clear to the summit, where we saw also a very little chinquapin, *Ribes*, and a few tufts of *Juncus* and grass growing in the crevices between the granite slabs. Otherwise the summit is a mass of huge, loosely piled boulders, with occasional patches of bare gravel. For a careful analysis of the flora of San Jacinto Peak see Hall (1902).

The abruptness of the eastern slope of the peak renders ascent from that side so difficult that we did not attempt to work the middle altitudes. The tremendous declivities to the desert below are so nearly vertical that, from the summit, we beheld the various desert stations previously explored spread out below us as on a gigantic relief map.

A consideration of the animal life did not enable us to distinguish the presence of any zone above Canadian. The area of sufficiently high altitude for more Boreal forms was probably too small to support any birds or mammals limited to these high altitudes.

In Round Valley gray squirrels and ground squirrels occur, as well as *Eutamias speciosus*, *E. merriami*, *Peromyscus maniculatus sonoriensis* and *P. boylei rowleyi*. Deer were seen on San Jacinto Peak up to nearly 10,000 feet, at the upper limit of *Ceanothus cordulatus*. Birds seen on the summit of the peak between 1:30 and 3:30 P.M., July 27, were: many Sierra juncos, and a lesser number of mountain chickadees, violet-green swallows, and white-throated swifts, one family of pigmy nuthatches, one rufous hummingbird, two San Diego wrens, one western house wren, and an unidentified hawk which appeared momentarily through a rift in the dense cloud bank overhead.

The members of the expedition who had ascended the mountains from San Gorgonio Pass, had a camp in Round Valley from July 6 to 12. The two authors of the paper made a visit to Round Valley and the summit of San Jacinto Peak on July 27, from their camp in Tahquitz Valley, and the junior author repeated this trip August 1 and 2.

LIFE AREAS OF THE REGION

The distribution of each one of the species of vertebrate animals inhabiting the San Jacinto area appears to respond to the influence of at least three entirely different orders of ecological delimitation. These three kinds of control are indicated by the adjectives: zonal, faunal, and associational. The conceptions involved in each are probably not subject to precise definition; at any rate we do not find it feasible even to attempt such treatment with the limited data thus far accumulated. In each case the general notion may be conveyed by the citation of instances, and by mere suggestions as to causative factors.

Life Zones

The concept of life zones has been the most commonly recognized of the three. The various factors involved have been exhaustively discussed by C. H. Merriam, in his various papers, notably the one giving the results of his studies on Mount Shasta (see Merriam, 1899). Further discussion, particularly germane in the present connection, is contributed in Hall's (1902) *Botanical Survey of San Jacinto Mountain*.

In a broad way the extent of life zones is dependent upon temperature, more particularly of the summer season. San Jacinto Peak rises to a height of 10,800 feet, from a base level on the west side of 1500 feet, and on the east side of less than 500 feet. This great increase in altitude brings commensurate but converse modification in temperature, varied locally, however, by a score of subsidiary factors.

The remarkable abruptness of the declivity on the northeast side of San Jacinto peak results in the crowding of all the zones from Lower Sonoran to Boreal into the extraordinarily narrow air-line distance of three miles. The zones represented on the immediate slopes of the mountain are thus (1) Lower Sonoran, (2) Upper Sonoran, (3) Transition, and (4) Boreal (see plates 6 and 7).

While we thus employ four zone names, Hall (1902) recognized five. Hall did not deal specifically with the Lower Sonoran zone, and hence omitted it in his enumeration. On the other

hand we have found ourselves unable to establish from our study of the vertebrate animals the presence of more than the lower division of the Boreal, namely, Canadian. Hall, from his study of the plants, recognizes all three divisions of the Boreal zone, namely, Canadian, Hudsonian, and Alpine-Arctic. His argument for the recognition of the last is based, it seems to us rather insufficiently, upon the presence of three species of plants peculiar to this zone. Since no exclusively Hudsonian species are listed by him, his recognition of the Hudsonian zone must rest on the presumption that if there is Alpine-Arctic, the interlying zone between it and Canadian must be present also.

In our examination of the vertebrate portion of the biota of the same localities studied by Hall, we have failed to discover any representative of exclusively higher zonal position than Canadian. Our use of the inclusive term Boreal in dealing with the animals appears to us both safer and more convenient than to use one or more separate designations for the divisions faintly indicated in the flora alone.

As a further consideration, there would appear to be small reason for the presence of anything above the Hudsonian at farthest. The relatively small area of sufficiently high altitude to bring even Hudsonian conditions might in itself be the cause of the absence of the requisite low temperature for the two higher zones, save in extremely limited spaces in the north-facing gulch at the head of Snow Creek, where snow banks linger nearly through summer. It was here that Hall found the three Alpine-Arctic plants.

A law is probably indicated in this and similar cases, that the sharper an isolated peak, that is, the more abrupt the flanking slopes, the higher extend the low zones; or, expressing the idea reversely, the larger the land mass of high altitude the lower extend the high zones. In the vicinity of Mount Whitney, 200 miles to the north of San Jacinto, the Canadian zone runs up to an average of 9000 feet, the Hudsonian to 11,200 feet. The highest point on San Jacinto is 10,800.

Thus altitude, latitude, and the above law all argue against the existence of zonal conditions on San Jacinto much higher than Canadian. The animal life certainly indicates this as far

as the vertebrates are concerned. Furthermore, the presence of a very small proportion of the elements of a higher zone may be better considered as a dilution of a lower zone rather than as justifying the formal recognition of the high zone.

We have found ourselves independently led to recognize an upper and a lower division of the Transition zone, this being in accord with Hall's proposal based upon the plants of the region. The modifying terms "upper" and "lower" will thus be frequently employed in the discussion of species. Transition, in its entirety, remains the same as in ordinary use.

In comparing our zone map with that of Hall's (1902, plate 2), minor differences will be observed. The chief one is in the vicinity of Hemet Valley, where scattering yellow pines occur over the more nearly level tracts. We have decided this tree, unquestionably Transition in usual zone position, to be best treated as denoting a Transition infiltration into a prevailingly Upper Sonoran area. This is because we found nothing but Upper Sonoran birds and mammals in the debatable area. The location of certain tracts in Hemet Valley where pines grow most numerously is indicated on our map by blue spots, as the only practicable way of showing this Transition admixture, without undue emphasis. We feel secure in our grounds for showing Thomas Mountain to be capped, merely, by Transition, wholly disconnected from the main Transition area on San Jacinto proper. The slopes of this mountain on all sides are certainly Upper Sonoran and not Transition as indicated on Hall's map. Remarks upon the zonal position of various other localities with reasons for our diagnoses will be found in our "Descriptions of Localities."

Faunas

In the restricted sense in which we believe the term best employed, a fauna is a subdivision of a life zone, based upon conditions of atmospheric humidity. Thus in travelling eastward across North America from the shore of the Pacific, at San Francisco, keeping within the same zone, say Transition, one passes through a series of belts possessing different assemblages of plants and animals. These divisions are no more sharply

defined than are zones, but their existence is readily appreciable when one considers large areas, and the recognition of them in dealing with problems of distribution is expedient as a measure leading to relative accuracy of treatment.

In the San Jacinto region two areas of very different faunal complexion meet. But only the Lower and Upper Sonoran zones are involved in this junction. Thus, to be absolutely correct, *four* faunas should be distinguished by name, one for each faunal division of each zone. We have, however, found it more convenient to combine the two Sonoran sections on the arid side under one name, Colorado Desert fauna, calling the two on the Pacific side together the San Diegan fauna or district. The inter-relations of these two faunas are discussed at length in another chapter (see pp. 388–392).

While the positions of life zones are determined chiefly by latitude and altitude, faunas are delimited by factors dependent upon proximity of oceans, and air currents in connection with topographic features. Faunas in North America tend towards a longitudinal, or north and south position, and hence transect life zones, cutting them up into lesser life areas.

Associations

The term "association" as applied to animals is allied in meaning to the "formation" of some botanists. Each association is inclusive of one or more of the botanist's "formations"; but it also includes the animal life present, even when, as happens with carnivorous forms, there may be no direct dependence upon plants.

The names employed in designating associations are taken from conspicuous or dominant permanent elements. Thus convenience is the sole criterion in selecting names. As with zones and faunas, associations are often capable of subdivision; in fact such splitting may be carried logically to the point where but one species occupies each its own niche. However, at the present stage of study, the larger groupings, or major associations, are most serviceable, with, in a few cases, recourse to smaller or minor associations.

The way in which the associational conception is made use of, will be more clearly perceived by reference to the distributional treatment of individual species. Let it suffice here to list some of the conspicuous associations, and then cite some instances in illustration of how these terms are used.

ASSOCIATIONS IN THE SAN JACINTO AREA

OF MAJOR RANK	OF MINOR RANK
Chaparral	Adenostoma
	Sage-brush
	Scrub-oak
	Chinquapin
Forest	Live-oak
	Yellow Pine
	Silver Fir
Riparian	Willow
	Chilopsis
	Mesquite
Rupestrine	
Meadow	
Sand-flat	Aeolian
	Wash

It is thus patent that a given major association may be present in several zones and faunas, but its minor divisions are much more restricted.

In definitely diagnosing the faunistic position of a species it may become necessary to use all three of these distributional conceptions. As examples: (1) *Sylvilagus b. cinerascens* and *Vireo vicinior* in the San Jacinto area are members of the Adenostoma minor association, of the Chaparral major association, of the San Diegan Faunal district of the Upper Sonoran Zone; (2) *Passerella i. stephensi* belongs to the Chinquapin minor association, of the Chaparral major association, of the San Bernardino Faunal division of the Transition zone; (3) *Perognathus spinatus* and *Peromyscus c. stephensi* belong to the Rupestrine association of the Colorado Desert fauna of the Lower Sonoran zone.

Just as with life zones and faunal areas, we find many species, of wide dispersal through two or more of even the major associations. For such cases various modifying terms become necessary.

In thus attempting to bring some degree of order into the distributional treatment of the species of a large area, we would urge a reasonable limitation. For efforts of this sort serve to impress upon the student the fact that there is the reverse of uniformity in the behavior of species. In fact if we should carry our analytical processes far enough, we should doubtless find that no two species anywhere exist under precisely the same set of conditions; hence the dependent conclusion that no two species occupy precisely the same area.

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GENERAL ACCOUNTS OF THE BIRDS

Colymbus nigricollis californicus (Heermann)

Eared Grebe

One seen at Hemet Lake, August 8; apparently still in the breeding plumage.

Podilymbus podiceps (Linnaeus)

Pied-billed Grebe

Seen only at Hemet Lake, where several were observed on August 10.

Phalacrocorax auritus albociliatus Ridgway

Farallon Cormorant

At Cabezon, May 11, a flock of about fifty was seen flying westward through San Gorgonio Pass. At Banning, June 8, one was taken on a reservoir near the town, a male in the brown, presumably immature, plumage (no. 2054). Observed elsewhere only at Hemet Lake, where a single bird was seen August 9.

Anas platyrhynchos Linnaeus

Mallard

Seen only at Hemet Lake, where on August 10 a flock of five, and on August 21 several flocks of ten or twelve, were noted.

Dafila acuta (Linnaeus)

Pintail

Migrating pintails appeared at Hemet Lake in August, a flock of six being noted on the 8th, and several larger flocks on the 21st.

Querquedula cyanoptera (Vieillot)

Cinnamon Teal

Observed at Hemet Lake in August, flocks being noted on the 8th, 10th, and 21st.

Marila affinis (Eyton)

Lesser Scaup Duck

A male scaup duck, presumably this species rather than the rarer *M. marila*, was seen at Hemet Lake, August 10.

Erismatura jamaicensis (Gmelin)

Ruddy Duck

Probably about fifteen individuals remained at the upper end of Hemet Lake during the first three weeks in August. They were seen almost daily, a large proportion of them being still in the bright breeding plumage, and were far too wary to permit a near approach.

Dendrocygna bicolor (Vieillot)

Fulvous Tree-duck

One reported by Richardson as killed by a hunter near Cabezon, May 20. It was flushed from the grassy bank of an irrigating ditch, and was undoubtedly a migrant.

Plegadis guarauna (Linnaeus)

White-faced Glossy Ibis

One killed by a hunter at Banning, June 7, was examined by Richardson. The owner would not part with the specimen, and the species was not otherwise encountered by the expedition.

Botaurus lentiginosus (Montagu)

American Bittern

One reported by Richardson as seen in a flooded alfalfa field near Cabezon, May 15; probably a transient.

Ardea herodias hyperonca Oberholser

California Great Blue Heron

Observed only at Hemet Lake, two seen on August 8 and one on August 10.

Nycticorax nycticorax naevius (Boddaert)

Black-crowned Night Heron

Migrating night herons were observed on numerous occasions on the east slope of San Gorgonio Pass, single birds being noted at Snow Creek, Whitewater, and Cabezon, on dates ranging from May 24 to June 3. Several seen at Hemet Lake early in August were also probably transients.

Butorides virescens anthonyi (Mearns)

Anthony Green Heron

Single birds, probably migrants, seen at Cabezon and Whitewater, on May 16 and 30, respectively. Next observed, a solitary individual, at Hemet Lake, August 15.

Fulica americana Gmelin

Coot

Seen only at Hemet Lake, where, during the first two weeks in August, the species was fairly common at the marshy upper end of the lake.

Steganopus tricolor Vieillot

Wilson Phalarope

Three seen together at the east end of Hemet Lake, August 11. One of these secured (no. 2946) is a female in juvenal plumage, with traces of first winter plumage appearing on the back. On August 22 a large flock of phalaropes was observed far out on the lake. From a distance they appeared to be too small for this species, and may have been *Lobipes lobatus*, but they could not be approached near enough for positive identification.

Recurvirostra americana Gmelin

Avocet

Encountered only at Hemet Lake. On August 8 a flock of ten, and on August 21 several single birds were seen along the shore at the upper end of the lake. The one specimen taken, an adult female secured on August 8 (no. 2942), is molting into winter garb, the plumage of the head, neck and upper breast being a mixture of gray and cinnamon colored feathers.

Himantopus mexicanus (Müller)

Black-necked Stilt

Seen on Hemet Lake in August, a flock of five on the 6th and several single birds on the 21st. Probably only a migrant through the region.

Gallinago delicata (Ord)

Wilson Snipe

On August 14 one bird, probably a migrant, was flushed from some marshy ground at the east end of Hemet Lake.

Pisobia minutilla (Vieillot)

Least Sandpiper

Fairly common in small flocks on the mud flats at the eastern end of Hemet Lake, August 6 to 16. One specimen was preserved (no. 2949), an immature male in first winter plumage.

Helodromas solitarius cinnamomeus (Brewster)

Western Solitary Sandpiper

Migrating individuals were seen along the shores of Hemet Lake on several occasions from August 6 to 16. Two specimens were secured (nos. 2947, 2948), on August 10 and August 15, respectively, both immature males.

Actitis macularius (Linnaeus)

Spotted Sandpiper

Apparently a migrant only. In the vicinity of Cabezon the species was noted on several occasions from May 12 to 20. Here they were seen along the little streams near the mouths of the cañons, usually single birds, though once as many as four were seen together. At Hemet Lake, August 6 to 16, scattered individuals were observed along the shores of the lake upon several occasions, and doubtless a little search would have revealed their presence at any time during this period. Two specimens were taken (nos. 1746 and 2067), both males in breeding plumage, the first secured at Cabezon, May 17, the second at Snow Creek, May 29.

Oxyechus vociferus (Linnaeus)

Killdeer

Seen on various occasions in the moister portions of Hemet Valley, between Hemet Lake and Kenworthy. They were not numerous, but some were ordinarily noted whenever we traversed these spots, as happened on several occasions between May 19 and July 5, and they were probably breeding here. At Hemet Lake in August they were abundant, frequenting the sparsely covered meadows on the north side and the mud flats at the east end. Three specimens were taken at the lake (nos. 2943–2945), August 7 and 15, probably birds of the year.

Oreortyx picta plumifera (Gould)

Mountain Quail

Of general distribution in the higher parts of the mountains, though seldom observed in any numbers. Near Kenworthy toward the end of May, small flocks of old and young together were frequently seen in the surrounding foothills, but never in the sage-covered valley. Near the summit of Santa Rosa Peak, the end of June, several small flocks composed entirely of adults, were seen. Not encountered in Strawberry Valley, though the species must occur there, but fairly numerous in the nearby Tahquitz Valley at the end of July. At Hemet Lake, in August, they were frequently seen in the rougher, more broken ground toward the lower end of the lake, but never in the open valley at the upper end, where *Lophortyx c. vallicola* was common. On Thomas Mountain, the middle of August, mountain quail were abundant, large flocks of nearly full-grown young being flushed at many points along the ridge.

The party collecting on the northern slopes of the San Jacinto Mountains did not meet with the species until the vicinity of Schain's Ranch was reached. At this point and at Fuller's Mill, the latter part of June, flocks of old and young together were seen occasionally, and specimens collected.

Near the east base of the mountains, at points in the lower reaches of Palm Cañon, and in the vicinity of Deep Cañon, mountain quail were several times observed amid the most arid,

desert surroundings. On May 27 a flock of six adults was encountered at a spring on the brink of Deep Cañon, where a flock of *Lophortyx gambeli* had been flushed earlier in the day; and on May 29 a single mountain quail was again seen at the same place. On May 26 a flock of adults, and on May 31 a brood of young, was observed along Carrizo Creek, near Dos Palmos Spring. The mountain quail seen at these neighboring points were probably all wanderers from the nearby Upper Sonoran piñon belt, attracted by the occasional springs along the lower cañons and washes.

On June 12 and 13 small flocks of adults were noted in different gulches in the vicinity of Potrero Spring, cañons tributary to Palm Cañon, from the east. This again is a region where *Lophortyx gambeli* is abundant.

The flocks of half-grown young seen in Tahquitz Valley, and the older immatures observed later, on Thomas Mountain, when startled, frequently behaved in a manner quite different from the usual habit of the adult mountain quail, and much like that of the forest-inhabiting species of grouse. Instead of running they took to the trees, where they sat motionless, and were very hard to see or to dislodge.

In all, nineteen specimens were secured: Schain's Ranch, four (nos. 1780–1783); Fuller's Mill, two (nos. 1867, 1868); Tahquitz Valley, three (nos. 2869–2871); Hemet Lake, one (no. 2956); Thomas Mountain, seven (nos. 3008–3014); Kenworthy, one (no. 2250); and Santa Rosa Peak, one (no. 2469).

According to the A. O. U. *Check-List* (1910, p. 135) the habitat of *O. p. confinis*, described originally from the San Pedro Martir Mountains, Lower California, extends north to include the mountains of southern California, even to the San Gabriel Mountains. It will have been noted from the heading of this account that we are not in accord with the idea reflected in the statement just referred to. Although we have no material from the San Pedro Martir region, we are fortunate in being able to compare adequate series from southern and east-central California.

The two characters offered by the describer of *confinis* (Anthony, 1889, p. 74) are, as compared with *plumifera*, relatively

"grayer upper parts and thicker bill." We have tested the material at hand as regards these two characters and are absolutely unable to distinguish our birds from the San Jacinto Mountains and elsewhere in southern California, from perfectly comparable material as regards age and stage of plumage from various parts of the Sierra Nevada, central as well as southern The Museum's series includes good specimens from extreme southern San Diego County: Campo, Mountain Spring, Cuyamaca and Volcan mountains. These, also, are in no appreciable way different from *plumifera*.

In other words, we see no excuse for using any name other than *plumifera* for the mountain quail of southern California.

Lophortyx californica vallicola (Ridgway)

Valley Quail

An abundant species in the San Jacinto Mountains, found at all suitable points from the Lower Sonoran valleys surrounding the range, up into the lower edge of Transition. Twenty-two specimens were collected, as follows: Snow Creek, three (nos. 2160–2162); Cabezon, five (nos. 1657–1661); Banning, four (nos. 2018–2021); Vallevista, three (nos. 3094–3096); Dos Palmos, two (nos. 2491, 2492); and Palm Cañon, five (nos. 3046–3050). Other points of record are Vandeventer Flat, Kenworthy, Hemet Lake, Thomas Mountain, Strawberry Valley, and Schain's Ranch. Most of these localities are in Upper Sonoran, the highest points only—Strawberry Valley (6000 feet) and Thomas Mountain (6800 feet)—being at the lower edge of Transition.

This quail breeds in greatest abundance on the sage-brush covered floor of the upper Hemet Valley, the region from Hemet Lake to Vandeventer Flat being peculiarly adapted to the species. At Kenworthy, in this valley, they were numerous, and nearly all in pairs at the time of our arrival, May 19. A nest was found here on May 23 (no. 72), very imperfectly concealed at the base of a scanty clump of sage brush. The slight depression in the ground forming the nest was scantily lined with grass and weed stalks; at this date it contained ten fresh eggs. A second nest, containing eight eggs, was found on June 23 in the same locality,

and in a similar situation. At Cabezon, May 7, and at Banning, June 8, two others were discovered, each of these also containing eight eggs.

Broods of young were noted, first at Banning, June 8, then at Dos Palmos, June 21, and, after July 1, whenever the species was encountered. Specimens taken at Banning early in June are in juvenal plumage; some from Vallevista, the first week in September, are in complete first winter plumage, but many half-grown juvenals were seen at the same time.

On Piñon Flat, at Dos Palmos, and at points in Palm Cañon, the valley quail and desert quail (*L. gambeli*), were found at the same places, frequently in the same flocks. In Palm Cañon at about 3000 feet, on June 12, and about the nearby Potrero Spring, 3500 feet, on the following day, the two species were seen flocking together. At Dos Palmos, in June and August, the same condition of affairs was noted. A frequent manner of occurrence here was for a female with her brood to be accompanied by five or six adults of either species. In the desert regions quail were usually observed along those ravines which contained occasional slight seepages of water.

The stations at Idyllwild and on the summit of Thomas Mountain may be taken as marking the highest range of the species in the San Jacintos. At the former point three were seen on June 8, at the latter a small flock August 17, each time in the near neighborhood of areas of chaparral extending upward between tracts of conifers, thus invading Transition.

Lophortyx gambeli Gambel

Desert Quail

A common species at the desert base of the mountains, ranging upward on the eastern slopes to the edge of Upper Sonoran. Our parties met with it at Piñon Flat, Dos Palmos, and Palm Cañon; none was seen at Whitewater, Snow Creek, Cabezon or Banning, though the species has been recorded from all these points (Gilman, 1907, p. 148). At Cabezon, however, a member of the expedition was told that the species was sometimes seen there in winter.

We preserved six specimens, as follows: Piñon Flat, one (no. 2486); Dos Palmos, four (nos. 2487–2490); and Palm Cañon, one (no. 3051).

Asbestos Spring, at the edge of Piñon Flat (altitude 4500 feet) and a point in Palm Cañon about eight or ten miles from its mouth (altitude 3000 feet), were the upper limits at which we found this quail. On Piñon Flat desert quail were seen on various occasions in May, June and August, in Palm Cañon (3000 feet), and Potrero Spring (3500 feet), June 12 to 14, at the mouth of Palm Cañon, and in the nearby Murray Cañon, June 14 to 17, and at Dos Palmos, in May, June and August.

A brood of small young was seen on Piñon Flat, June 2; toward the end of June, in the vicinity of Dos Palmos, several small flocks of old and young together were seen. A young male taken at the latter point on August 24 (no. 2489), is in the midst of the molt from juvenal to first winter plumage.

An adult male taken on Piñon Flat, June 2 (no. 2486), had its stomach and crop filled with ants and mistletoe berries from the surrounding junipers.

As mentioned under the previous species, there were points in Palm Cañon and the vicinity of Dos Palmos, where *L. gambeli* and *L. c. vallicola* were seen together. In fact, on two occasions, at the edge of Deep Cañon, May 27, and near Potrero Spring, June 13, these two species, together with *Oreortyx p. plumifera*, were all flushed from the vicinity of the same spring. In the overlapping of the ranges of the valley and desert quails, however, both here and at other points, it will be noted that it is the coast form (*L. c. vallicola*) which has invaded the typically desert environment of the other form (*L. gambeli*). Although the valley quail ranges continuously throughout the length of Palm Cañon, and over Piñon Flat, into Hemet Valley and on down to San Jacinto Valley, *gambeli* is stopped at the very edge of the Upper Sonoran zone, where the desert vegetation gives way to the coast chaparral, and it has not yet been found on the west side of the mountains.

Columba fasciata fasciata Say

Band-tailed Pigeon

Evidently now a rare species in the region traversed, at least during the summer months. Pigeons were seen in numbers, only in the vicinity of Schain's Ranch and Fuller's Mill, these being closely adjacent localities. Here, on various occasions from June 22 to July 4, single birds, or sometimes a pair together, were occasionally seen flying overhead, or flushed from the trees.

At Fuller's Mill (5900 feet) on July 1, a nest was found containing one egg (no. 67). The frail structure was placed on a large limb of an oak tree, about five feet from the trunk, and partly supported on one side by a small dead limb. The nest is a mere slight platform of sticks, mostly small dead twigs from pine and oak trees. The diameter of the mass is about 220 mm., though several straggling twigs extend far beyond this, the depth being 100 mm. The egg was slightly incubated. The female bird was flushed from the nest, and secured (no. 1866); another, possibly its mate, was seen nearby. Dissection of the female showed no additional egg in process of development.

The only subsequent occasion on which the species was encountered was on the summit of Thomas Mountain, on August 17, where a single bird was observed flying past. Pigeons were reported to have been numerous on an oak-covered mountain north of Hemet Lake. It is likely that at times they visit the mountains in numbers, possibly as migrants or winter visitants.

Zenaidura macroura carolinensis (Linnaeus)

Mourning Dove

Found in small numbers at most of the points visited in the mountains below Transition; at the desert base they occurred in great abundance. The highest points of record were Strawberry Valley (6000 feet), and Thomas Mountain (6800 feet), both just at the lower edge of Transition; at neither point were they at all numerous.

In the vicinity of Dos Palmos, in May, June, and August, and along Palm Cañon, clear to its mouth, in June, doves were of general distribution, though nowhere abundant. Along the

northern base of the mountains, at Whitewater, Snow Creek, Cabezon and Banning, this was one of the most common birds.

Nests containing eggs or young were found at Dos Palmos, Cabezon, and Snow Creek in May, and at Vallevista at the end of August. One discovered on the steep side of Deep Cañon, May 30, was on the ground under the shelter of an overhanging agave. The nest was a collection of fine twigs, built up at the lower side so as to form a shelf on the steep slope, and contained two incubated eggs. Others were found, as follows: two at Cabezon, May 5, built in low bushes three or four feet from the ground, each with two eggs; two at Snow Creek, one, May 27, in a sycamore, seven feet up, the other May 29, on the ground, under a bush, each with eggs; and two at Vallevista, August 30, both in low bushes in the chaparral, and each containing small young.

At Dos Palmos, though only a few individuals were breeding in the vicinity, the scattered springs and seepages attracted many more, some probably from a long distance. One shot May 29 contained undigested barley in its crop, which must have been eaten many miles away.

Seven specimens were preserved: Cabezon, three (nos. 1606–1608); Snow Creek, three (nos. 2163–2165); and Dos Palmos, one (no. 2493).

Cathartes aura septentrionalis Wied

Turkey Vulture

Not a common species in the mountains. A few were seen at different times in Hemet Valley, at Kenworthy in May, and at Hemet Lake in August. At the northern base of the mountains, the eastern slope of San Gorgonio Pass, they were rather more numerous, as at Whitewater, Snow Creek, Cabezon and Banning. A few were observed at Dos Palmos in May and June. In the San Jacinto Valley, about Vallevista and Hemet, large flocks were noted in August and September.

The two examples preserved (nos. 2345, 2346) were both caught in steel traps set for carnivores, and baited with meat, the bodies of skinned birds and mammals. The first (no.

2345, ♀), killed at Kenworthy, May 22, got into a trap set in the chaparral, and with the bait entirely concealed from above by the overhanging bushes, so that the bird apparently must have discovered it by the sense of smell alone. The second one (no. 3138, ♂), taken at Vallevista, was caught in the open wash, where the bait was in plain sight.

[Gymnogyps californianus (Shaw)

California Condor

Was not encountered by any member of the expedition. Formerly abundant, their numbers were greatly reduced through their eating of poisoned meat placed out for bears and other carnivores, and they are now either wholly extinct or extremely rare in these mountains. We were told that a pair formerly nested in the cliffs above Snow Creek, on the north side of San Jacinto Peak.]

Accipiter velox (Wilson)

Sharp-shinned Hawk

The capture of a single bird at Round Valley, July 7, suggests the possibility of the species occasionally breeding in this region. Another was seen on Tahquitz Peak, July 22. These are the only records for the season. The one secured (no. 2074) is an immature male, just beginning to molt into the adult plumage, numerous blue feathers showing among the wing coverts and secondaries.

Accipiter cooperi (Bonaparte)

Cooper Hawk

Common, for a hawk; generally distributed over the mountains and observed at most of the points visited. We have notebook entries relative to its occurrence at Dos Palmos, Toro Peak, Garnet Queen Mine, Kenworthy, Thomas Mountain, Hemet Lake, Strawberry Valley, Tahquitz Valley, Round Valley, Schain's Ranch and Cabezon. Specimens were collected as follows: Garnet Queen Mine, an adult female and three juvenals (nos. 2387–2390), Strawberry Valley, an adult female (no. 2656), and Vallevista, an immature male (no. 3457).

Two nests were found, one at the Garnet Queen Mine, June 27, containing three young in natal down, the other in Strawberry Valley, July 9, also with young. The first, placed in a golden oak, thirty feet up, was a rather bulky structure, built of sticks and crooked twigs, and lined with cedar bark. The female parent had been shot two days previous to the discovery of the nest, but the male bird had evidently since kept the young supplied with food, for in the nest were two headless and carefully plucked flickers, and fragments of another flicker, a California jay and a Merriam chipmunk.

The Strawberry Valley nest, also in a golden oak, was similar to the first one.

Buteo borealis calurus Cassin

Western Red-tailed Hawk

A common species encountered at every part of the range visited by our parties, except at the very highest altitudes above 9000 feet. Individuals were seen circling over the desert at the mouth of Palm Cañon, and at the upper limit of Transition, just below Round Valley. No nests were found, but full grown young, two or three together, attended by the old birds, were seen at Kenworthy on June 5, and near Vandeventer Flat, June 25 and July 2.

No specimens were preserved.

Buteo swainsoni Bonaparte

Swainson Hawk

A dark-colored hawk, doubtfully identified as of this species, was seen at Kenworthy, May 22. At Hemet Lake, August 7, two were seen under circumstances permitting of absolute recognition, though neither was secured. One was very dark colored, the other in the light phase, showing the white throat and dark pectoral band peculiar to the species.

Aquila chrysaëtos (Linnaeus)

Golden Eagle

From the number of birds seen it seemed probable that there were several pairs of eagles breeding in the region covered by us. Individuals were observed many times, at the San Gor-

gonio base of the mountains, at points in Hemet Valley, on Santa Rosa Mountain, at Deep Cañon, at Vallevista, and one bird, on July 7, quite fittingly circling over the very summit of San Jacinto Peak.

A nest was found May 20 in a narrow, rocky cañon near Cabezon. It was placed on a small ledge projecting from an almost perpendicular cliff, about 150 feet from the bottom of the cañon. The structural material was sticks and twigs solely, large, heavy branches in the outer walls (greasewood branches three feet long being distinguished), and smaller twigs interiorly, the whole mass being about four feet in diameter and from two to three feet thick. The single young bird it contained (no. 2134), much too small to fly, was fairly well covered with feathers, but with the natal down projecting between the feather tracts.

But one of the parent birds was seen, circling far overhead, and never venturing very near. In the nest were the fragmentary remains of a skunk (*Mephitis*).

About the camps at Snow Creek, Cabezon and Banning, eagles were seen daily, but it is probable that the Cabezon pair covered at least this much territory in their foraging, so that the same birds may have been seen over and over again.

On Santa Rosa Mountain, June 28 and on several subsequent occasions, two full-grown young and their parents were seen circling about, or sitting in the three tops. In all probability the young had been hatched somewhere in the vicinity.

Falco mexicanus Schlegel

Prairie Falcon

Observed only on the desert side of the range, single birds being seen at Dos Palmos, on May 27, at the mouth of Palm Cañon, June 15, and at Black Hill (near Dos Palmos), June 18. The species probably breeds in the region.

Falco peregrinus anatum Bonaparte

Duck Hawk

Encountered on three occasions. On June 2 one was seen passing swiftly overhead on the trail a few miles east of Vandeventer Flat, at close enough range for us to determine with

certainty that the bird was of this species and not the somewhat similar *F. mexicanus*. At Hemet Lake one was secured on August 8, and another seen on August 10.

The specimen taken (no. 2941) is a male in immature plumage. The stomach contained the remains of a small finch, apparently *Amphispiza belli*, swallowed feathers and all.

Falco sparverius sparverius Linnaeus

Sparrow Hawk

A fairly common species in the mountains, through Upper Sonoran and into Lower Transition, sparingly at higher elevations. On the Pacific slope it was seen at various points in Hemet Valley, Schain's Ranch, Poppet Flat, Thomas Mountain, Strawberry Valley, and one bird at Round Valley on July 11. At the San Gorgonio base a few were seen about Banning and Cabezon, in May and June. At the desert base they were rare. A noisy pair was seen hovering about a rocky cliff at the mouth of Palm Cañon, June 15. Later in the season, August 23 to 27, when birds were scattering more widely, several were met with in the vicinity of Dos Palmos.

Three specimens were preserved: no. 1776, adult male, Schain's Ranch; no. 2574, adult female, Strawberry Valley; and no. 2575, immature male, Strawberry Valley. The two adults, shot on June 27 and July 10, respectively, are in excessively worn plumage; the immature, shot July 16, is full grown, and in fresh first annual plumage.

Aluco pratincola (Bonaparte)

Barn Owl

At the Banning camp, on June 7 and again on June 10, barn owls were heard calling at night. At Hemet Lake, August 6 to 16, barn owls were frequently heard at night, and on August 11 one was flushed from a pine tree near the upper end of the lake.

Asio wilsonianus (Lesson)

Long-eared Owl

Seen but once, at Round Valley, 9000 feet, on July 27, when a family of four was routed out of a dense clump of willows at

the edge of the cienaga. Three were secured, one adult female (no. 3456) and two immature males (nos. 3454, 3455). All were in freshly molted plumage, the two young ones still showing slight traces of down about the head.

These birds, were, of course, wanderers from a lower elevation, but it is of interest that the individuals composing the family should have clung together in their wanderings. This species however, is known to be rather more gregarious than most owls.

Strix occidentalis occidentalis (Xantus)

Spotted Owl

Call notes, undoubtedly uttered by individuals of this species, were heard in Strawberry Valley on the evenings of July 15, 16, and 30, and at Thomas Mountain, on the evening of August 18. At the former place the calls were all heard issuing from the same spot, a point on the steep, heavily wooded hillside bounding the east side of the valley, about a mile above the Idyllwild resort. At Thomas Mountain they were heard just once, on the wooded slopes surrounding the spring where we camped.

Otus asio bendirei (Brewster)

California Screech Owl

Though not seen at any time during the summer, the presence of this species in the mountains was attested by unmistakable notes heard at night at various scattered points. Places where it was thus recorded are as follows: Cabezon, May 9 and 14, Banning, June 10, Santa Rosa Peak, June 29, Strawberry Valley, July 4, and at Hemet Lake several times from August 5 to 14.

Bubo virginianus pacificus Cassin

Pacific Horned Owl

Heard calling at various points in the mountains, but seen on only two occasions, one at Kenworthy on the evening of June 2, and another at the brink of Deep Cañon, August 26. Horned owls were heard hooting at night at Cabezon, May 12, Banning, June 9, Kenworthy, in May and June, Garnet Queen Mine, in

June, Strawberry Valley and Fuller's Mill in July, and at Hemet Lake during the first two weeks in August. One or two unmistakable horned owl feathers were picked up on June 15, in a dense tangle of shrubbery at the mouth of Murray Cañon, just above the floor of the desert.

Speotyto cunicularia hypogaea (Bonaparte)

Burrowing Owl

A common species in the lowlands on the Pacific side of the mountains, and in San Gorgonio Pass to the north, but apparently very rare or entirely absent on the desert side of the range, and not encountered by us higher than the very base of the mountains. It is abundant on the extensive grain fields of San Gorgonio Pass, as at Banning, where it was observed daily; beyond that point, where desert brush replaces the cultivated fields, it becomes more rare, though seen as far as Cabezon.

On the west side of the range, at Vallevista, several were seen on the stubble fields or near the edge of the adjoining brush land. It is an abundant species farther out on the extensive plains forming the San Jacinto Valley.

Four specimens were preserved, two adult males, one from Cabezon, May 23 (no. 2129), and one from Banning, June 12 (no. 2053), and two immature females from Vallevista, September 2 and 4 (nos. 3092, 3093). The two latter are in fresh fall plumage.

Geococcyx californianus (Lesson)

Road-runner

Observed at but one point within the mountains, at Kenworthy (altitude 4500 feet), where, on May 27 and 28, one was noted "singing" near the base of the hills. It is not probable that the species ranges to a much higher altitude in these mountains. On the desert slope of the Santa Rosa Mountains, the last week in May, and about the middle of June, single birds were seen from time to time. They were encountered at Cabezon in May, at Whitewater in June, and at Vallevista in September.

One specimen was preserved, a half-grown juvenal taken at Whitewater on June 5 (no. 2072).

Ceryle alcyon (Linnaeus)

Belted Kingfisher

Seen at but one point, at Cabezon, where, on May 22, an adult female, undoubtedly a migrant, was secured (no. 2130). The stomach of this bird contained grasshoppers and the bones of some small vertebrate. There are no fish in the small streams of the vicinity.

Dryobates villosus hyloscopus Cabanis & Heine

Cabanis Woodpecker

Abundant throughout the timbered portions of the mountains; seen in some numbers at every point visited, from Hemet Valley up to the summits of San Jacinto and Santa Rosa peaks. Points of record are: Kenworthy, Hemet Lake, Thomas Mountain, Schain's Ranch, Strawberry Valley, Tahquitz Valley, Round Valley, San Jacinto Peak, and Santa Rosa Peak. Nine specimens were preserved, two adults, six juvenals, and one immature in first winter plumage (nos. 2075, 2282, 2580–2582, 2866–2868, 2951).

After the first of July the young birds were much in evidence everywhere. The one immature (no. 2151, ♀), taken at Hemet Lake, August 7, has quite completed the molt from the juvenal to the first winter plumage.

Dryobates scalaris cactophilus Oberholser

Cactus Woodpecker

Of general distribution on the lower slopes of the desert side of the mountains, though apparently nowhere very abundant. The only breeding species of woodpecker in the region it inhabits. Observed at the following points: Snow Creek, Cabezon, Dos Palmos, Palm Cañon (up to 3500 feet), all in the Lower Sonoran zone. It was conspicuously associated with the agave belt, the dried stalks of this plant and the yucca affording nesting sites in a region that is practically treeless. The birds forage freely on low bushes and cactuses, and are thus independent of trees, but require some larger woody growth in which to bore their nesting holes. An unoccupied cavity was found at

Dos Palmos, June 1, in a dead yucca stalk, about five feet from the ground. An occupied nest was discovered in Palm Cañon, at about 3000 feet, on June 14, placed in a dry last year's yucca stalk about ten feet high and four and a half inches in diameter at the base. The entrance was forty-five inches above the ground, the total depth of nest cavity, twelve and three-quarters inches, and the diameter of the entrance one and one-half inches. It contained three small young, scantily covered with partly unsheathed feathers.

Along the railroad near Cabezon many telegraph poles were drilled into by these woodpeckers. From the number of perforations observed in a short distance the damage from this source must be of considerable magnitude, as the poles used here are so small as to be materially weakened by a cavity of the size of a woodpecker hole.

The species was rather unexpectedly encountered at Vallevista, at the Pacific base of the mountains. About six or seven of the birds were seen here between August 29 and September 5, all in the chaparral-covered washes and on the mesa near the foot of the hills. The surroundings are essentially desert-like, but it is doubtful if such conditions prevail in any continuous strip connecting this area with the desert proper east of the mountains. From the season at which these woodpeckers were observed here, they might be assumed to be wandering individuals, straying at random; but in this connection, and arguing against this assumption, it is interesting to note that certain other desert forms, a chipmunk (*Ammospermophilus leucurus*) and a lizard (*Callisaurus ventralis*), both certainly non-migratory, were also taken at this point (see page 326).

In all, twenty specimens of this woodpeeker were collected, as follows: Cabezon, nine (nos. 1702–1710), Snow Creek, five (nos. 2062–2064, 2152, 2153), Palm Cañon, three (nos. 3084, 3085, 15473), and Vallevista, three (nos. 3113–3115). Ten are adults, nine juvenals, and one an immature in first winter plumage. Very small young ones were taken from a nest on June 14, as mentioned above, but other juvenals were shot, while flying about, and, except on close scrutiny, indistinguishable from adults, as early as May 15, at Cabezon, and May 27 at Snow Creek.

The adults, compared with a small series of topotypes of *D. s. cactophilus* from Tucson, Arizona, and with others from southeastern Arizona show some difference in the size of the bill, the San Jacinto birds having this member appreciably longer and heavier. Other birds in the Museum collection from Mecca, Riverside County, California (on the Colorado Desert), and a series from the Colorado River between Needles and Yuma, are also of this larger-billed form, as compared with birds from southeastern Arizona. The birds occupying the Colorado Desert region in California, are thus intermediate in this respect, between typical *cactophilus* and the larger-billed *D. s. cremicus* of northern Lower California (see Oberholser, 1911, pp. 151, 152), and not typically representative of *D. s. cactophilus*.

Dryobates nuttalli (Gambel)

Nuttall Woodpecker

A decidedly uncommon species in the San Jacinto Mountains. Observed by us in limited numbers, and at but a few points, always in oak timber, in Upper Sonoran or the lower part of the Transition zone. Two broods, following the parent birds through the trees, were seen in the vicinity of our camp at Garnet Queen Mine, July 2; occasionally single birds were observed elsewhere: at Vandeventer Flat, May 25, at Oak Tree Spring (in the hills about midway between Kenworthy and Palm Cañon), June 11, in Strawberry Valley, July 22, at Hemet Lake (two seen between August 5 and 14), at Thomas Mountain (two seen between August 16 and 21), and at Schain's Ranch, June 18 to 28.

Four specimens were secured (nos. 1789–1791, 2395), three from Schain's Ranch, two full-grown juvenals, June 18 and 26, and an adult male June 28; and a full-grown juvenal from Garnet Queen Mine, July 2.

Xenopicus albolarvatus gravirostris Grinnell

Southern White-headed Woodpecker

A fairly common species in Transition, occurring less commonly above this zone, and not observed at all below. Thus in the San Jacinto Mountains it has a discontinuous range, occu-

pying three separated areas—the slopes and valleys south and west from San Jacinto Peak, down to about 6000 feet, a limited territory about the summits of Santa Rosa and Toro peaks with their connecting ridge, and the top of Thomas Mountain.

In Strawberry Valley white-headed woodpeckers were fairly common on the broken ground at the bases of the surrounding mountain sides, but were not seen out in the middle of the valley. In Round Valley and in Tahquitz Valley they were not common, though seen occasionally; on August 1 a few were noted on some high ridges just below San Jacinto Peak. Although the territory occupied by this woodpecker on Santa Rosa Mountain and on Thomas Mountain is limited in extent, the species was abundant at both places, more individuals being seen at these points than in any other areas of similar extent.

Several of the birds collected were redolent of the wood ants upon which they had been feeding; the plumage is more or less stained and gummed with pitch from the trees they frequented.

On Santa Rosa and Toro young in the nest holes were observed June 30; full grown young flying about in the timber, but attended by their parents, were secured at Fuller's Mill, July 3, at Strawberry Valley, July 7, and at Round Valley July 9.

Specimens were secured as follows: Fuller's Mill, five (nos. 1992–1996), Dutch Flat, one (no. 2146), Strawberry Valley, two (nos. 2576, 2577), Round Valley, three (nos. 2186–2188), Thomas Mountain, three (nos. 3018–3020), Santa Rosa Peak, four (nos. 2419, 2422–2424), Toro Peak, two (nos. 2420, 2421), twenty in all.

Examination of all the adults of *Xenopicus* now available from southern California, in comparison with lately acquired material from the Sierra Nevada, shows the large bill of the former to be constantly diagnostic. In other words, the existence of the race *gravirostris* is confirmed.

Sphyrapicus varius daggetti Grinnell

Sierra Red-breasted Sapsucker

Evidently a rare species in the mountains, or at any rate so quiet and secretive as to elude observation readily. Seen only at Fuller's Mill (6000 feet), and at Tahquitz Valley (8000 feet).

At the former point an adult female was secured (no. 1997), at the latter an adult male (no. 2854) and two full-grown juvenals (nos. 2853, 2855). Several others were seen in Tahquitz Valley, always in the clumps of willows bordering the marshy cienagas. One such thicket had been worked upon by the sapsuckers until almost entirely destroyed, though the surrounding shrubbery was untouched, a parallel instance to the one described from the San Bernardino Mountains (see Grinnell, 1908, p. 63). Several adults were seen in this thicket, and one of the juvenals secured there, but as a rule the birds quietly slipped out on the far side of the bush before they could be approached closely. For the use of the name *daggetti* see Swarth (1912, p. 35).

Sphyrapicus thyroideus (Cassin)

Williamson Sapsucker

A very few were seen and heard in Tahquitz Valley, July 19 to August 5, and in Round Valley, July 6 to 12. They were evidently uncommon in the mountains, and the few seen were difficult of approach.

Five specimens were secured, an adult male, two adult females, and a juvenal male from Round Valley, and a juvenal male from Tahquitz Valley (nos. 2077, 2078, 2189, 2190, 2852).

Melanerpes formicivorus bairdi Ridgway

California Woodpecker

Seen in moderate numbers at various points, all below 7000 feet, and almost invariably in large oak timber. Exact points of occurrence are: Stage road along San Jacinto River, at about 3000 feet, May 19; Kenworthy, a few seen in the hills on the west side of the valley, June 4; Vandeventer Flat, June 23, several; Schain's Ranch, June 17 to 29, seen daily; Poppet Flat, June 20 and 24, numerous; Fuller's Mill, June 30 to July 5, seen daily; Strawberry Valley, July, abundant; Hemet Lake, August 5 to 15, a few seen or heard at various times; Thomas Mountain, August 16 to 21, abundant. Thomas Mountain, altitude 6800 feet, is the highest point at which the species was noted.

Five specimens were preserved: An adult male from Fuller's Mill (no. 1999), an adult female (no. 2578) and an adult male (no. 2579) from Strawberry Valley, and a juvenal female (no. 3016) and a juvenal male (no. 3017) from Thomas Mountain.

Colaptes cafer collaris Vigors

Red-shafted Flicker

Not abundant anywhere until about the middle of July, when the young birds began to appear, and the adults, freed from the care of their families, wandered more widely and became more conspicuous.

A few were noted at Garnet Queen Mine, and on Santa Rosa and Toro peaks, toward the end of June and the first of July. A nest full of noisy young ones was discovered on the ridge just below Toro Peak, July 1.

In Strawberry Valley, early in July, and in Tahquitz Valley toward the end of the month, flickers were moderately abundant. In Round Valley also, during July, a number were seen. The party ascending the mountains from the San Gorgonio base first encountered the species at Schain's Ranch (4900 feet), not having observed it at any lower altitude. About Hemet Lake and on Thomas Mountain, during August, they were abundant

Five specimens were collected: Schain's Ranch, one (no. 1777), Poppet Flat, one (no. 1998), Garnet Queen Mine, one (no. 2386), and Strawberry Valley, two (nos. 2572, 2573).

Phalaenoptilus nuttalli californicus Ridgway

Dusky Poor-will

Observed in small numbers at various scattered localities. These ranged from the Lower Sonoran of the desert to the upper limit of Transition, but the birds seen at the highest altitudes in late summer were probably wanderers from below. The species was definitely recorded (occasionally seen, but more frequently heard calling in the evening or early in the morning) as follows: Cabezon, May 1–25, heard calling almost nightly; Banning, June 8–16, occasionally heard calling; Kenworthy, May 19–July 4, an occasional bird seen or heard calling at long intervals;

Palm Cañon, June 11–18, several seen or heard, from the mouth of the cañon up to about 3000 feet; Garnet Queen Mine, June 25–July 1, several heard; Tahquitz Valley, July 19–August 5, two seen; Dos Palmos, August 22–27, several heard.

Three specimens were secured: an adult male, Kenworthy, June 5 (no. 2276), an adult male, Dos Palmos, August 23 (no. 2495), and a juvenal male, Tahquitz Valley (no. 2851). These examples are all clearly referable to the Pacific Coast race *californicus*, rather than to the larger, paler *nuttalli*, or to the smaller, paler *nitidus*.

Chordeiles acutipennis texensis Lawrence

Texas Nighthawk

Seen at various points in Lower Sonoran on the desert slope of the mountains, nowhere in any abundance. A few were noted along the lower reaches of Palm Cañon, in June, the highest on a ridge above Potrero Spring, about 3500 feet. Near Cabezon, at the San Gorgonio base of the range, several were observed on May 5 and 13. At Kenworthy, late in the evening of May 23, a single nighthawk flew past, sailing close to the ground. This may possibly have been *C. virginianus hesperis*, but the hasty glimpse of the bird obtained in the twilight was insufficient definitely to establish its identity. It was the only nighthawk seen in the higher mountains. At Vallevista, at the Pacific base of the mountains, three Texas nighthawks were observed between August 29 and September 5.

Two specimens were preserved: an adult female, Cabezon, May 16 (no. 1772), and an immature female, Vallevista, September 2 (no. 3098).

Cypseloides niger borealis (Kennerly)

Black Swift

In Strawberry Valley, from July 9 to 16, black swifts were noted overhead almost daily. They were in companies of from two to ten, invariably circling high up in the air, far out of gun range. Peculiarities of color, flight, and notes, however, served to distinguish the species, even at a distance, and there

is no question as to the identification. The white-throated swift (*Aëronautes melanoleucus*), was frequently seen in the same place, occasionally at the same time that the black swifts were under observation, and there was never any difficulty in distinguishing the two species.

The black swifts were noted only during a week of cloudy, showery weather; presumably they fed at other times at too high an altitude to be seen from the valley.

Chaetura vauxi (Townsend)

Vaux Swift

Migrating birds, heading for the coast through San Gorgonio Pass, were seen daily in some numbers at Cabezon, May 10 to 16. Otherwise observed only at Vallevista, where a single bird was seen August 29, doubtless in the return migration.

Two specimens were taken, at Cabezon, May 10 and 11 (nos. 1711, 1712).

Aëronautes melanoleucus (Baird)

White-throated Swift

An abundant species throughout the San Jacinto Mountains; seen at practically every point visited, and doubtless breeding in suitable spots in all parts of the range. White-throated swifts were seen flying over the meadows in Hemet Valley, over the extreme summits of San Jacinto Peak and Toro Peak, the two highest points in the mountains, and over the desert, below Palm Cañon, Snow Creek, and Cabezon. They were particularly numerous in and about Deep Cañon, in June, the extremely high and precipitous enclosing cliffs supplying an ideal summer habitat.

Three specimens were preserved: an adult female, Cabezon, May 12 (no. 1713), an adult female, Kenworthy, June 3 (no. 2285), and an adult male, Hemet Lake, August 10 (no. 3002). The last is in the midst of the annual molt.

Archilochus alexandri (Bourcier & Mulsant)

Black-chinned Hummingbird

Seen at but a few points, and usually in limited numbers. Single birds (adult males, and hence easily recognized) were noted at Dos Palmos, the last week in May, at Strawberry Valley, July 10, and at Hemet Lake, August 15. The only locality where many were seen was at Hurley Flat, 3500 feet, situated on the north side of the mountains, southwest of Cabezon. Here, on May 9, they were numerous.

Two specimens, both adult males, were collected, one from Hurley Flat, May 9 (no. 1766), and one from Schain's Ranch, June 21 (no. 1963).

Calypte costae (Bourcier)

Costa Hummingbird

By far the most abundant species of hummingbird in the lower parts of the mountains, ranging upward to extreme upper Sonoran, Schain's Ranch, 4900 feet, being the highest point of record. They were fairly common in the brushy hills at Kenworthy, and also about Cabezon at the north base of the mountains, but on the desert side of the range, at Dos Palmos and Palm Cañon, they fairly swarmed in places. Here, in May and June, they were frequenting the thickets of desert willow (*Chilopsis*), at that time in full bloom. Most of the birds seen at these latter points were young of the year. But very few hummingbirds were seen at Dos Palmos upon our later visit, in August.

Nests were found at Cabezon, May 9, with eggs, May 14, building, May 16, with young, and at Kenworthy, May 24, with eggs.

Thirty-seven skins of the species were collected, as follows: Cabezon, six (nos. 1760–1765), Whitewater, two (nos. 2068, 2069), Banning, one (no. 2048), Schain's Ranch, thirteen (nos. 1842–1854), Kenworthy, three (nos. 2346–2348), Dos Palmos, eleven (nos. 2545–2555), Palm Cañon, one (no. 3086).

Calypte anna (Lesson)

Anna Hummingbird

Nowhere abundant, though observed and found breeding in various parts of the mountains. Apparently most numerous on the northern slopes of the range, where they were seen at Cabezon (one bird, May 16), in some numbers at Schain's Ranch, June 16–30, and occasionally at Fuller's Mill, June 31 to July 6. About the summit of Santa Rosa Peak, the last week in June, several were noted. These were probably wanderers from below, but others were seen about half way up the mountain, at the Garnet Queen Mine (altitude 6000 feet), and at this point the species was breeding. A nest was found here, built on the branching limb of a golden oak, overhanging the trail, of the usual structure and covered with lichens. This nest contained two young on June 26.

In Strawberry Valley, in July, some were encountered from time to time, but they were not abundant. A single bird was taken in Round Valley, July 9. At Hemet Lake, August 5 to 15, and on Thomas Mountain, August 16–21, they were seen daily. At Dos Palmos, August 23–27, a few were noted along the creek bottom, though the species had not been seen here on our previous visits early in the summer.

Seven specimens were collected: Schain's Ranch, one (no. 1855), Fuller's Mill, one (no. 2017), Round Valley, one (no. 2171), Santa Rosa Peak, one (no. 2438), Strawberry Valley, three (nos. 2722–2724).

Selasphorus rufus (Gmelin)

Rufous Hummingbird

After the first week in July many hummingbirds of this and the closely related species, *S. alleni*, were seen in the higher parts of the mountains, and during the remainder of our stay here, nearly two months, they continued to be numerous. The two species are so nearly alike that it is ordinarily impossible to distinguish them in life, and we were unable to ascertain their relative abundance; but of the specimens obtained the majority are *S. rufus*. There can be no doubt that neither breeds in the

region; both are transients, wanderers, attracted to the higher mountains by the abundance of wild flowers there at a time when the valleys are parched and barren.

Necessarily lumping the two, through the impossibility of distinguishing them, we made field observations as follows: Strawberry Valley, July 9, one immature seen; Round Valley, July 6–12, abundant; Tahquitz Valley, July 19 to August 15, abundant; on the summit of San Jacinto Peak, July 27, one seen; Thomas Mountain, August 16 to 21, seen daily.

Specimens referable to *Selasphorus rufus* were collected as follows: Tahquitz Valley, three (nos. 2762, 2764, 2765), Round Valley, two (nos. 2173, 2174), and Thomas Mountain, one (no. 3031).

Selasphorus alleni Henshaw

Allen Hummingbird

Three specimens unequivocally belonging to this species were collected: no. 2172, adult male, Round Valley, July 10; no. 2760, adult male, Tahquitz Valley, July 20; and no. 2761, immature male, Tahquitz Valley, July 21.

Stellula calliope (Gould)

Calliope Hummingbird

While this species probably breeds in the San Jacinto Mountains, we obtained no positive evidence to this effect, our few records being of individuals that might have wandered from distant points. An adult male was seen at Kenworthy, May 20, undoubtedly out of its nesting range at this low altitude. Two specimens were collected, an immature female at Round Valley, July 7 (no. 2175), and an immature male at Tahquitz Valley, July 20 (no. 2763), both feeding in company with the numerous rufous and Allen hummingbirds which had just invaded the mountains, and possibly likewise migrants from a distance.

Tyrannus verticalis Say

Western Kingbird

Abundant in the lower valleys, and breeding in the mountains in Hemet Valley, and noted in June at Kenworthy and

Vandeventer Flat. Observed in some numbers at Cabezon and Snow Creek in May, and at Banning in June. In the late summer they became still more numerous, and more widely spread, being met with at as high an elevation as Tahquitz Valley (8000 feet), where two were seen on July 20. Particularly abundant at Hemet Lake, August 5–15, where they were feeding in the open meadows surrounding the lake.

Four specimens were preserved, one from Cabezon, May 24 (no. 2131), two from Snow Creek, June 1 and May 31 (nos. 2147, 2148), and one from Hemet Lake, August 9 (no. 2986). The last mentioned, an adult female, is in exceedingly frayed plumage, but has not yet begun to molt.

Myiarchus cinerascens cinerascens (Lawrence)

Ash-throated Flycatcher

An abundant migrant throughout the region, and breeding commonly from the base of the mountains at least as high as Strawberry Valley (6000 feet). A pair was seen at Garnet Queen Mine, 6000 feet, where it was probably nesting, but others observed a few days later on the summit of Santa Rosa Mountain, 2000 feet higher, were, with little doubt, wanderers from lower points. At Cabezon, early in May, and at Dos Palmos the end of May, they were migrating in considerable numbers. At Kenworthy, June 8, a pair was seen carrying building material, and on June 14, in Palm Cañon at about 3000 feet, an occupied nest was found. By the first week in July the young began to appear.

In August migrating birds were abundant, at Hemet Lake, Dos Palmos and Vallevista, a large proportion evidently young of the year.

Twenty-five specimens were collected: Snow Creek, three (nos. 2149–2151), Cabezon, three (nos. 1679–1681), Schain's Ranch, five (nos. 1926–1930), Fuller's Mill, one (no. 2000), Dos Palmos, five (nos. 2496–2500), Strawberry Valley, five (nos. 2586–2590), Hemet Lake, two (nos. 2983, 2984), Vallevista, one (no. 3127).

Sayornis sayus (Bonaparte)

Say Phoebe

Probably breeds along the eastern base of the mountains, though we failed to find it doing so in the few places where it was encountered. Observed as follows: a few seen the first week in May in the vicinity of Cabezon; a single bird observed singing on the brink of Deep Cañon (3000 feet), May 31; a full-grown juvenal secured at Vandeventer Flat, July 2, undoubtedly a wanderer from the desert below; numerous about Hemet Lake in August, when the late summer dispersal was well under way.

Two specimens were collected, both full-grown juvenals: Vandeventer Flat, July 2 (no. 2295), and Hemet Lake, August 11 (no. 2987).

Sayornis nigricans (Swainson)

Black Phoebe

Distributed over the lower parts of the range, nowhere abundant, but present at all suitable spots. At Kenworthy on June 5 a nest which the young had just left was found at the entrance of a small tunnel.

Found nesting in Strawberry Valley, 6000 feet, probably the uppermost breeding limit of the species in these mountains. Here, on July 17, a nest was found built on the window casing of a deserted cabin, and containing four half-grown young. Although no nests were discovered on the desert side of the range the presence of a single bird in Palm Cañon at about 3000 feet, on June 13, two families at the mouth of Palm Cañon, June 14, and a single bird by one of the pools in Deep Cañon, June 21, may be taken as evidence of the probable breeding of the species at these points. Adults, apparently breeding, were taken at Cabezon in May, where, however, they were not common.

In the late summer they increased in numbers, and also wandered to higher elevations, being seen in July in Tahquitz Valley (8000 feet) and in Round Valley (9000 feet). They were particularly abundant about the shores of Hemet Lake, in August.

Eleven specimens were collected: Cabezon, two (nos. 1700, 1701), Schain's Ranch, one (no. 1787), Poppet Flat, one (no. 2002), Strawberry Valley, two (nos. 2591, 2592), Round Valley, two (nos. 2216, 2217), Hemet Lake, one (no. 2988), and the mouth of Palm Cañon, two (nos. 3076, 3077).

Nuttallornis borealis (Swainson)

Olive-sided Flycatcher

Observed in some numbers over most of the range, migrating at the lower levels in May and June, and later on found breeding at the higher points visited. In Hemet Valley, at Kenworthy and Vandeventer Flat, they were seen migrating up to June 2. On the north slopes of the mountains, at Cabezon in May, and at Snow Creek the first week in June, they were daily seen passing through. Birds observed at Fuller's Mill toward the end of June, on Santa Rosa Peak at the end of June, in Strawberry Valley, Tahquitz Valley, and Round Valley, in July, were undoubtedly nesting. In Strawberry Valley a nest was found on July 9, placed in a small clump of mistletoe near the end of a drooping cedar bough, about twenty feet above the hillside. It was not looked into, but probably contained young, as one of the parents arrived with insects in its bill.

In August they were seen about Hemet Lake, evidently beginning to wander from the breeding grounds, and also on Thomas Mountain. None was encountered at any time along the desert base of the mountains, at Dos Palmos or in Palm Cañon, though they might be expected to occur there during the migrations.

Ten specimens were collected: Cabezon, seven (nos. 1672–1678), Vandeventer Flat, one (no. 2302), Santa Rosa Peak, one (no. 2470), and Strawberry Valley, one (no. 2585).

Myiochanes richardsoni richardsoni (Swainson)

Western Wood Pewee

A common species, nesting in abundance from high Upper Sonoran upwards. At lower points it was encountered migrating in some numbers, at Cabezon early in May, at Dos Palmos from May 26 to June 1, and at Snow Creek and Whitewater, June

3. At Kenworthy (4500 feet) a nest was found in course of construction on June 9. Other nests were found, one building at Garnet Queen Mine, June 26, and one with three eggs at Fuller's Mill, June 22. At various collecting stations in higher parts of the range, Santa Rosa Mountain, Strawberry Valley, Tahquitz Valley, and Round Valley, the birds were everywhere numerous, usually along the water courses. At Hemet Lake and on Thomas Mountain, in August, they were also abundant.

Twenty-three specimens were collected: Snow Creek, three (nos. 2143–2145), Cabezon, three (nos. 1682, 1683, 1685), Hurley Flat, one (no. 1684), Schain's Ranch, five (nos. 1913–1917), Fuller's Mill, one (no. 2001), Strawberry Valley, two (nos. 2583, 2584), Tahquitz Valley, one (no. 2803), Round Valley, two (nos. 2110, 2215), Thomas Mountain, one (no. 3036), Vandeventer Flat, one (no. 2303), Garnet Queen Mine, two (nos. 2474, 2475), and Dos Palmos, one (no. 2506).

Empidonax difficilis difficilis Baird

Western Flycatcher

Found breeding in small numbers at a few points in high Upper Sonoran and in Transition, usually being seen or heard in the dense vegetation along the streams. Migrating birds were taken at Cabezon early in May, and at Dos Palmos the end of May. A few belated migrants were noted at the desert base of the mountains the middle of June, one taken at Palm Cañon (3000 feet), June 13, one taken at the mouth of Palm Cañon, June 15, and one heard at Banning, June 10.

At Garnet Queen Mine a few were seen, and on June 26 a nest was found containing three small young, the nest being placed in the end of a broken-off log, about eight feet above the bed of the stream.

In Strawberry Valley, in July, a few of the birds were seen or heard daily along the streams. Occasional birds beginning to appear in Tahquitz Valley at the end of July were probably wanderers from lower points. On Thomas Mountain, August 16–21, they were noticeably abundant.

Twenty-one specimens were collected, eighteen skins, as follows: Cabezon, three (nos. 1697–1699), Snow Creek, one (no. 2139),

Strawberry Valley, four (nos. 2593–2595, 2606), Tahquitz Valley, two (nos. 2801, 2802), Thomas Mountain, four (nos. 3038–3041), Garnet Queen Mine, two (nos. 2460, 2461), Dos Palmos, one (no. 2507), Palm Cañon, two (nos. 3079, 3080); and three newly hatched young taken at Garnet Queen Mine, and preserved in alcohol (no. 15475).

Empidonax trailli trailli (Audubon)

Traill Flycatcher

Seen only on the desert side of the mountains until the late summer movement began, when they appeared in numbers at other points. Migrating birds were taken at Cabezon in May. At Dos Palmos at the end of May, they were present in some numbers, migrating as we supposed; but since many more were seen at the same spot the third week in June, they were possibly breeding. Here they frequented the thickets of desert willow marking the course of Carrizo Creek. We found them in very similar surroundings in Palm Cañon, the middle of June, at the mouth of the Cañon and at various points up to about 3000 feet.

During the first two weeks in August they were noticeably abundant at Hemet Lake, the following week (August 16–20) a number were seen on Thomas Mountain (altitude 6800 feet), and later, August 22–27, many were observed along Carrizo Creek, below Dos Palmos.

Nineteen specimens, all adults, were preserved: Cabezon, six (nos. 1686–1691), Snow Creek, three (nos. 2140–2142), Banning, one (no. 2052), Dos Palmos, five (nos. 2501–2505), Palm Cañon, one (no. 3078), Hemet Lake, two (nos. 2989–2990), and Thomas Mountain, one (no. 3037).

Empidonax wrighti Baird

Wright Flycatcher

The status of the species of small flycatcher breeding in the Boreal zone of the mountain ranges of southern California is a problem that can not yet be considered satisfactorily solved, in spite of the large amount of material accumulated during the last few years. It seems apparent, however, that the breeding

bird of this region is not *Empidonax griseus* Brewster, as it has heretofore been considered. Large, gray-colored birds apparently referable to this latter species occur regularly in southern California during the migrations, and in winter, but are never seen during the breeding season nor in the high mountains, while, on the other hand, individuals of the *wrighti* type are of extremely rare occurrence away from their nesting ground in the Boreal zone. The fact that the wandering examples of *griseus* are usually in quite fresh plumage, while of the summer specimens of *wrighti* in our collections a large proportion are juvenals, and the adults mostly in very worn condition, though the color differences are thereby accentuated, gave the impression that these differences were mostly seasonal, or from wear. All the southern California breeding birds, however, are of the smaller size, with shorter, broader bill, and brown-colored lower mandible, characteristic of *wrighti*, while the migrants from the lowlands of the region which we now regard as examples of *griseus*, are of larger size, with longer and more slender bill, and with light-colored lower mandible.

It appears, therefore, that both species occur in southern California, *griseus* as a regular but rather uncommon migrant and winter visitant in the valleys, more commonly on the desert, and *wrighti* as an abundant summer visitant in the comparatively limited area of high Transition and Boreal of the mountains. The fact that the latter species is of exceedingly rare occurrence, almost unknown, in the lowlands of the region, points to similar habits of migration to those of *Passerella i. stephensi*, and *Oreospiza chlorura*, occupying precisely the same summer habitat. All three species depart from the region in fall and enter again in the spring, without visiting the adjacent plains and valleys.

The similarity of *wrighti* and *griseus*, both in appearance and habits, is such as to have caused them for years to be confused, but there is little doubt but that there are two such distinct forms, though the occurrence of numerous individuals with difficulty allotted to one or the other species seems to indicate the possibility of intergradation between them. Such intergradation, indeed, was pointed out by Brewster (1889, p. 88), in his descrip-

tion of *E. griseus*, not only between *griseus* and *obscurus* (=*wrighti*), but also between *obscurus* and *hammondi*, extremely small, dark-colored examples of *hammondi* at the one extreme, and large gray-colored specimens of *griseus* at the other, with *wrighti* occupying middle ground; all of which is abundantly illustrated in the collections of this Museum. As pointed out by the above author, however, species of *Empidonax* with difficulty distinguished in the cabinet skin, may be perfectly distinct forms, and it seems advisable for the present to treat the above three species as such.

Apparently nothing is known of the nesting habits of *E. griseus*, the published breeding ranges being merely general statements, with no precise data to support them. The observed facts bearing on the migration and winter home of the species do not tend to shed any light on the probable breeding ground of this large, pale-colored *Empidonax*. It is generally stated to breed commonly in southern Arizona, on just what grounds is unknown to us, but in this connection mention of a specimen in juvenal plumage (no. 5865, coll. H. S. Swarth), apparently referable to *E. griseus*, taken in that region, may be of interest. This bird, a juvenal female, was secured in the foothills of the Huachuca Mountains, October 1, 1907, evidently a very late-hatched bird, and in itself no proof whatever of the species breeding in the immediate vicinity. Compared with juvenals of *wrighti* it shows differences exactly comparable with those distinguishing adults of the two forms—decidedly grayer coloration, and longer, more slender bill, with conspicuously lighter colored lower mandible. It is quite unlike any juvenals at hand from the mountains of southern California, and the Museum contains a number in comparable plumage. These well-marked characters appearing in the juvenal plumage strongly support the idea of the specific distinction of *E. griseus*.

The Wright flycatcher was found breeding in abundance in the higher parts of the San Jacinto Mountains. On Santa Rosa Mountain it occurred down to the lowest edge of Transition, there sharply defined, numbers of the birds being seen or heard at the Garnet Queen Mine, altitude 6000 feet. On the higher slopes of Santa Rosa Peak and Toro Peak, though present, it was much

less numerous. The species was not observed in Strawberry Valley, low Transition and practically the same elevation as the Garnet Queen Mine, though found at Fuller's Mill nearby; two thousand feet higher, in Tahquitz Valley, and from there upwards, it was a very common species. Some of the birds were seen but a few hundred feet below the summit of San Jacinto Peak.

In Round Valley during the first two weeks in July they were common. A nest was found here on July 10, containing on this date four newly hatched young. It was placed in a gooseberry bush, about two feet above the ground, and was imperfectly concealed. In Tahquitz Valley toward the end of July, the birds were abundant, the broods of young being now out of the nests, and perched in the trees and bushes, attended by their parents.

Specimens were collected as follows: Cabezon, one (no. 1695); Garnet Queen Mine, Santa Rosa Mountains, three (nos. 2462–2464); Fuller's Mill, three (nos. 2003–2005); Tahquitz Valley, sixteen (nos. 2828–2832, 2834–2836, 2838, 2839, 2843–2845, 2856–2858); Round Valley, twelve (nos. 2106–2109, 2218–2221, 2837, 2840–2842), San Jacinto Peak, one (no. 2833), thirty-six in all. Twenty-one of these are adults, fifteen in juvenal plumage. One of the adults, no. 2841, Round Valley, July 27, has begun the annual molt, patches of new feathers appearing on the breast, dorsum and crown, and the new plumage is noticeably dark in coloration, very different indeed from fall specimens of *E. griseus*.

Empidonax griseus Brewster

Gray Flycatcher

The collection includes four small flycatchers taken near Cabezon, at the northern base of the mountains, which we have, with some hesitation, placed in a different category from the breeding *E. wrightii* of the higher elevations. These birds (nos. 1692–1694, 1696) were collected, the first three on May 4, the last on May 16, and were, of course, transients at this locality. In pale coloration and color of bill they are referable to *griseus*,

though none presents the extreme of characters of that race, and they may possibly be merely intergrades, or individual variants. At the same time (May 14) a typical example of *E. wrighti* was taken at the same place.

Otocoris alpestris actia Oberholser

California Horned Lark

Abundant on the extensive flats of upper Hemet Valley, at Hemet Lake, Kenworthy, and east nearly to Vandeventer Flat. At Kenworthy in June large flocks of old and young together were to be seen everywhere on the pasture land. A very few were noted at points on the desert side of the San Gorgonio Pass, three or four at Cabezon, May 4, and another small flock at Whitewater, May 25, at both places in small cultivated patches of ground. In the stubble fields about Banning, and from there westward, it was a very abundant species.

Six specimens were preserved: one from Banning (no. 2051), and five from Kenworthy (nos. 2296–2300), all adults.

Cyanocitta stelleri frontalis (Ridgway)

Blue-fronted Jay

Notably abundant in Strawberry Valley, much more so than at any other point visited. At Schain's Ranch, the lower edge of Transition, and at Tahquitz Valley, high Transition, they were present, but in lesser numbers. Very few were noted in Round Valley. On Santa Rosa Mountain they were also exceedingly scarce. At Hemet Lake, early in August, and on Thomas Mountain a little later, they were seen daily, at that time probably beginning to scatter out more widely over the mountains.

Twenty-seven specimens were preserved from the following points: Schain's Ranch, two (nos. 1778, 1779); Fuller's Mill, five (nos. 1869–1873); Strawberry Valley, sixteen (nos. 2556–2571); Tahquitz Valley, one (no. 2875); Thomas Mountain, one (no. 3015); Toro Peak, one (no. 2466); Santa Rosa Peak, one (no. 2467).

Of the sixteen specimens taken in Strawberry Valley, a large proportion were killed in rat traps set for flying squirrels in the branches of oak trees.

Aphelocoma californica californica (Vigors)

California Jay

A common species in Upper Sonoran chaparral. Observed in numbers throughout Hemet Valley, at Hemet Lake, Kenworthy, and Vandeventer Flat, and ranging upwards commonly to the altitude of Schain's Ranch (4900 feet), less numerously to that of Garnet Queen Mine (6000 feet). On June 2 many were seen on Piñon Flat. At Dos Palmos they were encountered in small numbers along the creek, at the end of May and early in June, and again at the end of August.

Along the San Gorgonio base of the mountains, at Cabezon, Snow Creek, and Banning, California jays were seen in the brush quite to the foot of the hills, but no farther, none being observed in the brush on the desert floor.

At Kenworthy, toward the end of May, families of small young were frequently met with in the thickets of scrub oak in the valley. At Hemet Lake, in August, specimens of juvenals were taken molting into the first winter plumage; a bird taken at Vallevista September 2 has quite finished the molt.

Eighteen specimens were preserved, as follows: Hurley Flat, one (no. 1745), Schain's Ranch, four (nos. 1918–1921), Kenworthy, seven (nos. 2257–2263), Dos Palmos, one (no. 2494), Hemet Lake, four (nos. 2952–2955), Vallevista, one (no. 3104).

A form of this jay supposed to be distinct from *californica* has of late years come to be recognized as occupying extreme southern California, namely *A. c. obscura* (Anthony, 1889, p. 75). The characters for the distinguishment of this form, as given by the latest critical student of the genus (Ridgway, 1904, p. 330) are, as compared with *A. c. californica*: smaller size (except bill) and darker coloration. We have no material from the San Pedro Martir region, but we do have large series of skins from Monterey and other localities in the type region, together with plentiful material from San Diego County and elsewhere in southern California.

We find that, as regards size, there is no perceptible difference in either mass or proportions. In coloration we have tested for shade of dorsum, shade of blue on wings, head and tail, grayish

tints beneath, and tinge of blue on lower tail coverts. In not one of these respects do we find the least apparent difference, *always taking perfectly comparable specimens into consideration, as regards age and stage of plumage wear.* We cannot help but believe that misinterpretation has resulted from inadequate material; for there is a very great modification of colors through the year accompanying abrasion and fading of the plumage. Furthermore, comparison with birds from the Sierra Nevada area is not pertinent in this connection. Since the name *californicus* was applied to the coast form (Monterey, in the Santa Cruz district), and since, as we are thoroughly convinced ourselves, birds from the San Diegan district and the Santa Cruz district are identical, there is no justification for using the name *obscura* for the southern California *Aphelocoma.*

If distinction is to be made anywhere among these jays in California, separate designation should more properly be given to birds of the Sierra Nevada area, which are somewhat paler and larger than the coast form.

Corvus corax sinuatus Wagler

Western Raven

Not common. Seen in small numbers, single birds or two together, at various times and places, none at a higher elevation than Kenworthy, 4500 feet. At Deep Cañon, June 19, two suddenly appeared, circling overhead while we were working over the carcass of a mountain sheep, though none had been noted during the days previously spent at this point.

Single birds were seen as follows: near Hemet, May 19, at Whitewater, May 1 and June 3, and Cabezon, May 8. One was noted at Kenworthy, June 9, and several, feeding on the carcass of a calf, August 9. Several at Dos Palmos, August 23 to 27.

Nucifraga columbiana (Wilson)

Clarke Nutcracker

Met with in but very small numbers and at few points. During July a few were seen daily in Round Valley and in Tahquitz Valley; one on July 7 at the summit of San Jacinto Peak. In

a damp meadow near the summit of Toro Peak two were seen June 30, and a single bird July 1, the only ones noted in the Santa Rosa Mountains. A solitary straggler taken on the sagebrush flat at Kenworthy, June 8, was the only individual noted below high Transition.

Four specimens were secured: Kenworthy, one (no. 2256), Round Valley, one (no. 2073), Tahquitz Valley, one (no. 2846), and Toro Peak, one (no. 2468). All are adults in rather worn plumage.

Cyanocephalus cyanocephalus (Wied)

Piñon Jay

Seen only in Hemet Valley, where they were at times abundant. At Kenworthy, during the last week in May and the first half of June, large flocks appeared almost every day, feeding on the ground in the sagebrush covered valley. Flocks were encountered between Kenworthy and Hemet Lake, June 6, and at Hemet Lake, August 9.

Eleven specimens were preserved, all taken at Kenworthy (nos. 2239–2249). Three are adults, eight full grown juvenals.

Xanthocephalus xanthocephalus (Bonaparte)

Yellow-headed Blackbird

Observed as a migrant at Cabezon, during May. Four specimens were taken (nos. 1646–1649), an adult male and three females. Not encountered elsewhere.

Agelaius phoeniceus neutralis Ridgway

San Diego Red-wing

Seen only in the vicinity of Hemet Lake. As some were observed in June they were probably breeding on the marshy ground at the head of the lake. In August small flocks were noted here on several occasions.

Sturnella neglecta Audubon

Western Meadowlark

Breeds abundantly in the lower parts of the mountains. In San Jacinto Valley, to the westward, and in San Gorgonio Pass,

to the northward, it was exceedingly numerous, but we did not find it in the desert region at the eastern base of the range. Breeds in numbers as high as Kenworthy and Vandeventer Flat, in Hemet Valley, and at Schain's Ranch, 4900 feet, where breeding birds were taken. In the late summer they were encountered at much higher elevations, at Round Valley, 9000 feet, July 9, and at Tahquitz Valley, 8000 feet, July 20. These were undoubtedly wanderers from below, and not to be supposed to have nested at these altitudes.

Ten specimens were collected: Cabezon, two (nos. 1653, 1654), Whitewater, one (no. 2055), Banning, one (no. 2028), Schain's Ranch, one (no. 1788), Round Valley, two (nos. 2079, 2080), Hemet Lake, one (no. 2950), Kenworthy, two (nos. 2293, 2294).

The two Round Valley specimens, taken July 9, are full grown juvenals. The Hemet Lake example, August 11, is well along in the post-juvenal molt.

Icterus parisorum Bonaparte

Scott Oriole

Occurs in a fairly well-defined area on the desert slope of the mountains, where it was not uncommon. We encountered it at points in Palm Cañon, and in the adjacent Dos Palmos and Piñon Flat regions. Here it occupied the agave belt, about at the point of mergence of Upper and Lower Sonoran, not being once seen in the higher Upper Sonoran of the neighboring Vandeventer Flat and Hemet Valley just above, nor in the Lower Sonoran of the desert foothills just below where the agave was replaced by cholla cactus. It was most abundant in Palm Cañon at about 3500 feet, and at Dos Palmos and Deep Cañon, at about the same altitude. A few were seen on Piñon Flat (4000 feet) and at Asbestos Spring (4500 feet). Omstott Creek, just west of Piñon Flat, is about the western limit of the species in the mountains, though on one occasion, June 23, a bird was heard singing half a mile farther west.

About our camps at Dos Palmos and in Upper Palm Cañon, in May and June, the loud, ringing note of this oriole was one of the most conspicuous audible evidences of bird life. The male

birds were frequently seen, perched on the agaves or flying overhead, but they were remarkably shy, seldom permitting a near approach. In fact, the only specimen secured, an adult male (no. 2485) taken at Dos Palmos June 1, flew into a tree within gunshot of the collector, who was sitting, unobserved, near camp.

At the time of our last visit to Dos Palmos and Deep Cañon, late in the summer, August 22 to 27, the orioles seemed to have already abandoned their breeding grounds, for none was to be seen. To all appearance food was more abundant then than earlier in the season, the plentiful summer rains having brought forth an abundance of vegetation, with a corresponding abundance of insect life.

Icterus cucullatus nelsoni Ridgway

Arizona Hooded Oriole

Seen at but a few points, in the lowest parts of the range. On the desert side they were largely confined to the immediate neighborhood of the Washington palms. Thus at Dos Palmos Spring, the last week in May, there was a nest of the Arizona hooded oriole containing small young, in one of the palms by the spring, while the species was not seen elsewhere in the vicinity. At the mouth of Palm Cañon they were common, and breeding in the palm trees, as also at the mouth of Murray Cañon near by. They did, however, ascend Palm Cañon somewhat farther up than the palm trees extended, being seen in cottonwoods at Little Paradise, about 2500 feet.

At Cabezon they were fairly abundant during May; toward the end of the month a number of nests were found, one or two in cottonwoods, but the majority in palm trees on deserted ranches in the vicinity. The species was seen at Banning, June 8, and at Hemet, May 19, undoubtedly nesting at both places.

Five specimens were taken: Cabezon, three (nos. 1726–1728), Snow Creek, one (no. 2155), and Vallevista, one (no. 3126). The Vallevista specimen, taken August 30, is in juvenal plumage throughout.

Icterus bullocki (Swainson)

Bullock Oriole

Common nearly everywhere, up to the lower edge of Transition. Abundant at Cabezon in May, migrating early in the month and found breeding a little later. At Kenworthy they were also numerous in May and June, feeding in the sagebrush to a great extent, and also frequenting the scattered clumps of yellow pines. On June 10 after a high wind, a nest with four broken eggs was found under a pine tree. Also seen at Vandeventer Flat, Banning, Schain's Ranch, and Strawberry Valley, probably breeding at all these points. Single birds noted in Tahquitz Valley, July 25 and 29, were undoubtedly wanderers from lower down.

Eleven specimens were preserved, as follows: Cabezon, three (nos. 1729–1731), Banning, one (no. 2047), Schain's Ranch, one (no. 1786), Kenworthy, four (nos. 2286–2289), Dos Palmos, one (no. 2508), and Strawberry Valley, one (no. 2616).

Euphagus cyanocephalus (Wagler)

Brewer Blackbird

Fairly common at many points in the lower parts of the mountains. Breeding colonies were observed at Cabezon, Kenworthy, and Vandeventer Flat. Strawberry Valley, 6000 feet, was the highest point at which the species was encountered in the San Jacintos. Here, in July, flocks of old and young together, frequented the corrals and pastures. At Hemet Lake, early in August, they were abundant.

Six specimens were preserved, three from Cabezon (nos. 1650–1652), and three from Kenworthy (nos. 2290–2292).

Carpodacus purpureus californicus Baird

California Purple Finch

Fairly common in Strawberry Valley during July. The only other places where the species was encountered were a little meadow just below the summit of Toro Peak, where, on July 1, several were seen, and Tahquitz Valley, where two specimens were taken, an adult female, July 20, and a juvenal male, July

29. The latter two were probably wanderers from a lower elevation. Thus the California purple finch was found in the San Jacinto mountains under very similar conditions to those observed in the San Bernardino Mountains (see Grinnell, 1908, p. 88), occurring in both regions in a limited area of low Transition on the Pacific side of the mountains, and preferably in the vicinity of streams. Nine specimens were collected (nos. 2636–2642, 2727, 2731), seven from Strawberry Valley, and two from Tahquitz Valley.

Carpodacus cassini Baird

Cassin Purple Finch

Fairly common in Tahquitz Valley (8000 feet), and in Round Valley (9000 feet), during July. A single adult male, secured at Fuller's Mill (6000 feet), July 1, was the only one seen at any other point.

In Tahquitz Valley small flocks of full-grown juvenals frequented the grassy meadows. Twelve specimens were preserved: Fuller's Mill, one (no. 1890), lower slopes of San Jacinto Peak, two (nos. 2081, 2082), Round Valley, three (nos. 2083, 2084, 2730), Tahquitz Valley, six (nos. 2726, 2728, 2729, 2732–2734).

Carpodacus mexicanus frontalis (Say)

California Linnet

A common species, encountered in some numbers at every point visited, up to the lower limits of Transition. Nests with eggs or young were found at Cabezon early in May, at Kenworthy toward the end of May, at the mouth of Palm Cañon, and at Dos Palmos and Deep Cañon, in the middle of June, and at Garnet Queen Mine at the end of June. Where houses were available the birds made use of them; thus at Kenworthy and Garnet Queen Mine, nests were placed in niches about the abandoned mine buildings. At the mouth of Palm Cañon, and in Murray Cañon they were built in the palm trees and in cactuses; in Deep Cañon, May 30, a nest with four incubated eggs was found in a cactus.

The highest points at which the species was observed were Strawberry Valley, 6000 feet, where several were seen July 14, Santa Rosa Peak, 7500 feet, where a few visited a water hole at our camp, June 30, and on Thomas Mountain, 6800 feet, where a few were noted at various times from August 16 to 21.

At Vallevista, during the first week in September, they were fairly abundant, and feeding on the ripe fruit of the yucca.

Eleven specimens were preserved, as follows: Cabezon, one (no. 1644), Sehain's Ranch, two (nos. 1863, 1864), Banning, one (no. 2046), Snow Creek, one (no. 2168), Kenworthy, two (nos. 2349, 2350), mouth of Palm Cañon, one (no. 3035), Vallevista, three (nos. 3121–3123).

Loxia curvirostra bendirei Ridgway

Sierra Crossbill

In Round Valley, on August 1 and 2, several single birds, and companies of two or three together, were seen and heard, flying to and fro high overhead, and occasionally alighting for a few moments in the tops of the tallest trees. The incessant utterance of the loud call-note made them very conspicuous, but from their continually restless movements it was difficult to secure specimens. One was finally obtained as it darted from a tree top, where it had been calling, unseen, in the heavy foliage. During previous visits to Round Valley, three members of the expedition having established a camp there, July 6 to 12, and two others having visited it on July 27, no crossbills were seen. Had they been present, and acting as they were at the later visit, they could not have been overlooked.

The only other place where the species was observed was at Vallevista, where two were seen on August 31, and another September 3. This record station is extraordinary, the locality being a brush-covered Lower Sonoran sand wash at the base of the mountains; but there is no doubt as to the identity of the birds seen. The first two darted into a pepper tree under which camp was pitched, and sat in full view, calling continuously. They were off again at the first movement of the observer. The other bird seen, circled about overhead, calling at frequent intervals.

The specimen secured (no. 2725) is an adult male, and practically like examples from the San Bernardino Mountains (see Grinnell, 1908, p. 91), and from Mount Pinos (see Grinnell, 1905, p. 385). These birds are all sufficiently distinct both from *Loxia c. minor* and *L. c. stricklandi* to justify the use of the name *bendirei* in this connection. They are about intermediate in size between the very small *minor*, represented in the Museum collection by examples from the eastern United States and from the northwest coast, and the very large *stricklandi*, as represented by specimens from the mountains of southern Arizona.

Astragalinus tristis salicamans (Grinnell)

Willow Goldfinch

Seen only along the San Gorgonio Pass base of the mountains. They were not numerous there, but small numbers were seen almost daily, at Cabezon during May, and at Banning early in June. A nest was found in an almond orchard at Cabezon. One specimen was preserved (no. 1642), an adult male taken near Cabezon, May 10.

Astragalinus psaltria hesperophilus Oberholser

Green-backed Goldfinch

Fairly common at most points visited up to the lower edge of Transition. Seen during May and June at various points in Hemet Valley between Hemet Lake and Vandeventer Flat. A few were noted about Dos Palmos at the end of May and early in June. A nest found in the nearby Deep Cañon, May 30, was placed in one of the few cottonwoods scattered along the bottom of the gorge. Several birds were seen June 15 at the mouth of Murray Cañon, just above the floor of the desert.

Found in abundance along the northern base of the mountains, at Snow Creek, Cabezon, and Banning.

The highest points of record are Strawberry Valley, 6000 feet, Garnet Queen Mine, 6000 feet, and Thomas Mountain, 6800 feet.

Nine specimens were collected: Hurley Flat, one (no. 1643), Fuller's Mill, one (no. 1894), Strawberry Valley, three (nos. 2662–2664), Garnet Queen Mine, three (nos. 2416–2418), and Vallevista, one (no. 3131).

Astragalinus lawrencei (Cassin)

Lawrence Goldfinch

Observed at various points in the lower parts of the mountains, though seldom seen in any numbers. Most numerous in San Gorgonio Pass, at Cabezon and Banning, and also at Schain's Ranch. Not seen at all on the desert slopes, Omstott Creek being apparently about the eastern limit of the species in this region. Found ranging up to the lower edge of Transition, as at Fuller's Mill, Strawberry Valley, and Garnet Queen Mine, all about 6000 feet elevation.

A nest containing young was found at Cabezon, May 4. Full-grown juvenals were taken at Poppet Flat, June 24, and one was seen at Strawberry Valley, July 16.

Fifteen specimens were secured, as follows: Banning, three (nos. 2043–2045), Snow Creek, one (no. 2169), Schain's Ranch, two (nos. 1859, 1862), Poppet Flat, three (nos. 1860, 1861, 1897), Fuller's Mill, two (nos. 1895, 1896), Strawberry Valley, one (no. 2665), Garnet Queen Mine, two (nos. 2374, 2375), Omstott Creek, one (no. 2544).

Spinus pinus pinus (Wilson)

Pine Siskin

An abundant species in the higher parts of the San Jacinto Mountains. A few were seen at Schain's Ranch (4900 feet), and at Fuller's Mill (6000 feet). In Strawberry Valley (6000 feet) they were rather more abundant, while in the higher, Canadian zone valleys, Tahquitz (8000 feet) and Round Valley (9000 feet), numerous flocks were observed daily. A single bird taken near the summit of Santa Rosa Peak on July 1, was the only one seen in this part of the range.

No positive evidence was secured to prove the breeding of this species in the region explored, though the capture of full-

grown juvenals in Round Valley, July 26, and Tahquitz Valley, July 29, might be taken as such.

Small flocks encountered in Strawberry Valley in July were feeding on thistles. At Hemet Lake, August 5 to 14, they were several times noted feeding in weed patches in the open meadows about the lake.

Thirteen specimens were taken: Round Valley, four (nos. 2115, 2201, 2777, 2778), Tahquitz Valley, two (nos. 2776, 2779), Strawberry Valley, five (nos. 2657–2661), Hemet Lake, one (no. 3005), Santa Rosa Peak, one (no. 2425).

Passerculus sandwichensis alaudinus Bonaparte

Western Savannah Sparrow

Several, migrants undoubtedly, were seen in an alfalfa patch near the station at Cabezon, May 4. Small sparrows, not definitely identified but supposed to be of this species, were seen in the grassy fields at the upper end of Hemet Lake on several occasions between August 11 and 15.

Ammodramus savannarum bimaculatus Swainson

Western Grasshopper Sparrow

The discovery of this species breeding in the San Jacinto Mountains was an unexpected result of the season's work. The birds were seen at but one point, in a meadow at Schain's Ranch, altitude 4900 feet, where several were noted, and three secured. The specimens taken (nos. 1799–1801) were an adult male, June 28, and an adult male and a juvenile female, June 29. As several others were seen and as both adults taken were males, there were apparently at least two pairs of the birds with their broods in this little meadow. The young secured is in the streaked, juvenile plumage, and there seems little reason to doubt that it was hatched in the immediate vicinity.

Chondestes grammacus strigatus Swainson

Western Lark Sparrow

A common species in the valleys west of the mountains, extending eastward through San Gorgonio Pass. Seen in abund-

ance in the latter region as far east as Cabezon. In the mountains proper it was noted in fair numbers at Kenworthy in May and June, and, the highest record station, at Schain's Ranch, 4900 feet, in May.

Eighteen specimens were taken: Cabezon, four (nos. 1622–1624, 2132), Banning, two (nos. 2036, 2037), Snow Creek, one (no. 2167), and Schain's Ranch, eleven (nos. 1815–1825).

Zonotrichia leucophrys leucophrys (Forster)

White-crowned Sparrow

Observed migrating in fair abundance during May, at Cabezon, on the desert side of the range. Seen elsewhere only at Kenworthy, where a single bird was taken May 24. In southern California this species is largely confined to the desert regions east of the mountains, where it is a fairly common migrant. In the Pacific slope valleys it is of decidedly rare occurrence.

Six specimens were taken by the expedition, five at Cabezon (nos. 1617–1621), and one at Kenworthy (no. 2355).

Spizella passerina arizonae Coues

Western Chipping Sparrow

An abundant species in the higher parts of the mountains. Seen commonly from the altitude of Schain's Ranch (4900 feet) and Strawberry Valley (6000 feet) upward on San Jacinto Mountain, and from Garnet Queen Mine (6000 feet) upward on Santa Rosa Mountain. Not seen in Hemet Valley until after the termination of the nesting season. Early in August flocks composed largely of juvenals were noted in weed-grown fields about Hemet Lake. The middle of August they were conspicuously abundant on Thomas Mountain.

Though not encountered in the lower parts of the mountains proper, the species was noted, rather singularly, at one low zone station at the northern base of the range. In Banning (2300 feet) chipping sparrows were seen at various times during the second week in June, in orchards and gardens in the town, and it accord-

ingly seems possible that they were breeding there. The species is known to breed in similar situations in certain Upper Sonoran valleys west of the mountains.

Twenty-eight specimens were collected, as follows: Round Valley, one (no. 2200), Tahquitz Valley, two (nos. 2847, 2848), Strawberry Valley, nine (nos. 2666–2674), Fuller's Mill, three (nos. 1891–1893), Schain's Ranch, four (nos. 1908–1911), Hemet Lake, five (nos. 2966–2970), Thomas Mountain, one (no. 3030), Garnet Queen Mine, one (no. 2433), Toro Peak, two (nos. 2431, 2432).

One partial albino was secured: no. 2969, ♀ juv., Hemet Lake, August 14. It is in the juvenal plumage, but with the following areas pure white: rump, upper tail coverts and all but two of the rectrices, most of the primaries, and the primary coverts of each wing, almost the entire under surface of the body, and some feathers on the nape. Some of the dusky juvenal streakings are present on the sides of the breast.

Spizella breweri Cassin

Brewer Sparrow

At the end of May and during June this species was fairly common in the sagebrush of Hemet Valley. It was observed by us at Thomas Valley, Kenworthy, and nearly to Vandeventer Flat, and was undoubtedly breeding throughout this region. At Cabezon, early in May, small flocks of Brewer sparrows were seen on several occasions, apparently migrating. They were found nesting nowhere on the desert slopes of the mountains. Fairly common in the chaparral at Vallevista, August 29 to September 5.

Five specimens were collected, two at Cabezon (nos. 1634, 1635), and three at Vallevista (nos. 3118–3120).

Spizella atrogularis (Cabanis)

Black-chinned Sparrow

A common species on the northern and western slopes of the mountains, but not encountered at any point on the desert side.

They were particularly numerous in Hemet Valley, where the characteristic song of the male bird was to be heard on all sides, from Kenworthy to Vandeventer Flat, and beyond as far as Omstott Creek and the lower parts of Santa Rosa Mountain. As a rule they frequented the chaparral-covered hills, rather than the sage-brush of the valley, but were found in the latter also where the growth was particularly dense, as between Vandeventer Flat and Santa Rosa Mountain.

On the northern slopes of the range, in May and June, many were seen at Cabezon, Banning and Schain's Ranch; as small juvenals were taken they were evidently nesting at these points.

Two nests were found, one at Kenworthy, May 21, the other between Vandeventer Flat and Santa Rosa Mountain, June 25. The two, very similar in construction, were both in sagebrush about two feet from the ground, well concealed, and discovered only by the sudden flight of the female. The first contained four eggs, far incubated; the second, three eggs, one infertile, the others incubated. Of the first found, the nest and broken egg shells were saved (no. 78); the second nest was preserved with the eggs intact (no. 73). The shells of no. 78 are clear nile blue without a trace of maculation; those of no. 73 are nile blue with sparse dotting of sepia, cinnamon, and fawn color, these markings being agglomerated around the large ends of the eggs. The latter set measures in millimeters: 17.9 x 14.3, 17.8 x 14.2, 17.6 x 14.1.

The parent birds were extremely shy, the male singing at a safe distance, the female hovering about uttering excited "chips," but not permitting a near approach.

During May and June the male birds uttered their brief song at frequent intervals throughout the day. The song of the black-chinned sparrow is absolutely distinct from that of any other bird of southern California. A description may be attempted as follows: The male bird selects the tip of the tallest shrub in the chaparral in the vicinity of its nest. This perch is seldom more than six feet above the ground, usually on the rising slope above the nest. In one instance a singing bird was at the tip of a scrub oak at least fifteen feet above the ground; in another a male was observed at the extreme top of a dead pine, about

one hundred feet from the gound, where he sang for some time before descending to the brush beneath; but these are exceptional cases.

The song is a brief series of notes run together rapidly, the series repeated at irregular intervals, as often as fifteen seconds apart, but with occasional lapses of many minutes. All the notes of the series are on apparently nearly the same pitch. But the first three at least, which are uttered with relative deliberation and distinctness, are of rising inflection; the rest of the series are uttered so rapidly that individual intonation is lost. To describe the sequence in other words, the first note of the series receives most stress, the rest successively less stress until the last ones are scarcely distinguishable to the ear. The pitch is very high, wiry, but not loud or piercing. The general impression is of a weak song. It certainly does not carry far; on the contrary, a bird may be singing close at hand, and give the impression of great distance.

If comparisons be made, we should say that in length of song, and frequency of repetition, the black-chinned sparrow is like the Lazuli bunting; in sequence of notes, uniformity of pitch, and increasing rapidity of utterance it is like the wren-tit; in rising inflection of each of the first few notes of the series it is like the cañon wren; in high-pitched quality of tone and general weakness it resembles the western gnatcatcher. The song of the eastern field sparrow, according to memory, most nearly resembles that of the black-chinned sparrow.

Aside from the song of the male, the only other vocalization possessed by the black-chinned sparrow, is the chipping sparrow-like "chit" of both sexes, usually low but sharp, and as an expression of alarm, intensified.

The upward limit of the species in the San Jacinto Mountains during the breeding season appeared to be about 6000 feet, just at the lower edge of Transition. They were encountered at about this altitude at Fuller's Mill, and near Garnet Queen Mine. That this species evinces the tendency, common to many low zone birds, to invade higher altitudes in late summer, was demonstrated by the capture of an immature specimen in Tahquitz Valley, 8000 feet, on July 26.

Early in August they were fairly common at Hemet Lake. Here they frequented certain open, gravelly areas near the shores of the lake, where there was a thin growth of low weeds in which the birds fed in scattered flocks of eight or ten.

Twenty-six specimens were taken, from the following points: Cabezon, five adults (nos. 1636–1640), Hurley Flat, one (no. 1641), Schain's Ranch, one (no. 1865), Banning, two juvenals (nos. 2041, 2042), Kenworthy, five adults (nos. 2306, 2307, 2310–2312), Vandeventer Flat, one adult (no. 2308) and one juvenal (no. 2309), Tahquitz Valley, one immature (no. 2849), Hemet Lake, nine immatures (nos. 2957–2965). The Tahquitz Valley and Hemet Lake specimens are all in complete first winter plumage, no adults being secured after the post-nuptial molt. The female taken with the set of eggs near Vandeventer Flat (no. 2308) is distinctly marked with black on the chin, quite as conspicuously as many male birds.

Junco oreganus thurberi Anthony

Sierra Junco

A common species in the higher parts of the mountains, from the lower edge of Transition upwards. The lowest point at which juncos were seen was Schain's Ranch (4900 feet). At Strawberry Valley, Tahquitz Valley, and Round Valley, and in the Santa Rosa Mountains, both at Garnet Queen Mine and on the ridge from Santa Rosa Peak to Toro Peak, they were numerous.

Two nests were found at Schain's Ranch, June 22. They were in like situations, on the ground, near small streams, and well hidden in the shrubbery. One contained two eggs and two newly hatched young, and the other held three incubated eggs. Another nest was discovered in Tahquitz Valley, July 21. This was placed in a depression in a bank, adjoining a little stream, and concealed by overhanging grasses and ferns. As large young were seen by the third week in June, it accordingly seems probable that a second brood is sometimes raised. On Thomas Mountain, August 16 to 20, they were gathered in relatively large flocks. Specimens taken at this time were well advanced in the annual molt.

Sixty specimens were preserved, as follows: Fuller's Mill, eight (nos. 1964–1971), Round Valley, fourteen (nos. 2086–2092, 2191–2195, 2206, 2207), Tahquitz Valley, twelve (nos. 2928, 2930–2940), Strawberry Valley, four (nos. 2646–2649), Garnet Queen Mine, eight (nos. 2383–2385, 2406–2410), Santa Rosa Peak, seven (nos. 2411–2415, 2426, 2430), Toro Peak, three (nos. 2427–2429), Thomas Mountain, four (nos. 3026–3029).

Amphispiza bilineata deserticola Ridgway

Desert Black-throated Sparrow

A common species on the desert foothills; one of the few birds that is even fairly abundant on the hot, dry mesas forming its habitat. Seen scattered through the brush at Dos Palmos, and in Palm Cañon from the floor of the desert at the cañon mouth up to about 3000 feet. In San Gorgonio Pass it was one of the characteristic birds at Whitewater, Snow Creek, Cabezon, and Banning.

A nest containing two eggs (no. 77) was found near the brink of Deep Cañon, June 1. It was in a little gully, about a quarter of a mile from water, and placed in a clump of *Dalea johnsonii*, about one foot from the ground. It was loosely fastened among the forking branches, being held in place more by the general thorniness of the shrub than by any evident forethought in its construction. The material of the nest is mostly gray, weathered grass, and some fine weed stems. The parent bird slipped quietly off the nest, flew to some distance, and did not return.

This may have been a second set, full-grown juvenals being seen on the same date. As young birds at about the same stage of development were secured in this locality late in the summer, August 23 to 27, the nesting season appears to be rather protracted. Adults taken during the last week in August had nearly finished the annual molt.

The species was encountered at one place west of the mountains, a single bird being seen at Vallevista, September 4.

Twenty-six specimens were preserved: Snow Creek, two (nos. 2070, 2166), Cabezon, seven (nos. 1628–1633, 2125), Banning,

two (nos. 2038, 2039), Dos Palmos, eleven (nos. 2516–2526), Palm Cañon, four (nos. 3042–3045).

Amphispiza belli (Cassin)

Bell Sparrow

Fairly common, mostly in the sagebrush of the Upper Sonoran Zone. The species was first noted at an altitude of about 3000 feet as we entered the mountains from the west on the stage road following the course of the San Jacinto River. At Kenworthy, in May and June, it was noticeably abundant and undoubtedly breeding, though we found no nests. Here the birds frequented the denser growth of sagebrush on the floor of the valley. During the first week in June flocks of five or six individuals were occasionally encountered, possibly non-breeding birds, for the majority of the species were in pairs and scattered through the brush at fairly regular intervals. The birds forming flocks were silent, usually feeding on the ground, while of the paired birds the male spent a large portion of the time perched upon a projecting limb of a bush, and uttering his song at frequent intervals.

On the north side of the mountains Bell sparrows were fairly common in the greasewood of the foothills above Cabezon. In ascending the "Hall Grade" at this point, they were first seen at about 2000 feet, and from there on up to Hurley Flat. Also encountered during June at Banning and at Schain's Ranch.

In the late summer, juvenals were secured at much higher altitudes than those frequented during the nesting season: in Tahquitz Valley (8000 feet), July 25, 28, 29, and in Round Valley (9000 feet), August 2. Abundant at Hemet Lake during August, and at Vallevista, at the western base of the mountains, August 29 to September 5. At the latter point they were gathered in flocks.

Adults taken at Schain's Ranch the latter part of June are in the midst of the annual molt, while some collected at Hemet Lake, August 11, have nearly finished it. Full-grown juvenals were secured the last week in June, and others not yet molting from the juvenal plumage, as late as August 6.

Thirty-one specimens were collected: Hall Grade, two (nos. 1626, 1627), Schain's Ranch, six (nos. 1902–1907), Poppet Flat, one (no. 2010), Banning, one (no. 2040), Kenworthy, seven (nos. 2356–2362), Tahquitz Valley, six (nos. 2859–2864), Round Valley, one (no. 2865), Hemet Lake, five (nos. 2971–2975), Vallevista, two (nos. 3116, 3117).

Melospiza melodia cooperi Ridgway

San Diego Song Sparrow

Nowhere abundant, and yet represented in suitable places almost wherever such occur. Noted as follows: At Cabezon, May 20, one was seen in the cañon bottom near camp; at a cienaga at about 2000 feet altitude in Snow Creek Cañon, one was heard and seen repeatedly, May 28 and 31; near Banning, June 6, 8 and 14, single individuals were noted; several were heard or seen in ravines and meadows, and one (no. 1912) taken, at Schain's Ranch, 4900 feet, June 18; in the cañon of the San Jacinto River, near Oak Cliff, at 2000 feet altitude, one was heard, May 19; and in the lower Palm Cañon, 800 to 1200 feet altitude, several were observed, and two (nos. 3053, 3054) taken, June 15 and 16. It is probable that the species was breeding at all these places.

The song sparrows in this region appeared to be restricted to Riparian or almost Palustrine associations, below the Transition zone; this accords with the occurrence of the race *cooperi* elsewhere in southern California. The thing of startling interest was its occurrence in the cañons on the desert base of the mountains, without departing in its subspecific characters from the average of *cooperi* as occurring throughout the San Diegan district. The two specimens from Palm Cañon are adults, in very good plumage for comparative purposes. They do not differ in appreciable degree from *cooperi* from the Pacific slope of southern California; in other words they show no perceptible approach towards the very different *M. m. saltonis* of the Colorado desert around Mecca, at the northwest end of Salton Sea.

This is significant when it is considered that conditions of flora, temperature, and humidity, are to all appearances very

similar in lower Palm Cañon to what they are at Mecca; at least is this true of those conditions immediately surrounding the song sparrow. In Palm Cañon, just the same as at Mecca, the plants foraged through are arrow-weed, mesquite, and small areas of wire grass.

It is probable that song sparrows in Palm Cañon have been there for at least several generations, for the senior author collected a specimen typical of *cooperi* there December 28, 1903. It would therefore appear that the supposedly "susceptible" song sparrow (at any rate in this race) is in reality not subject to quick modification of characters in the lifetime of the individual, or through several successive generations.

It is patent from geographic contiguity, as well as characters, that the colonies inhabiting Palm Cañon and others of the cañons of the desert drainage of the San Jacintos, were originally stocked from the Pacific side. The elapsed time has not been sufficient for the impress by the new and strange environment of modifications to a perceptible degree.

It would appear that here, under perfectly natural conditions, we have an experiment of just the sort demanded by experimentalists to prove whether or not subspecific differences are subject to abrupt modification by changed environment. In this case the characters are much more stable than has been supposed (see Beebe, 1907).

Melospiza lincolni lincolni (Audubon)

Lincoln Sparrow

Found only in the Boreal meadows of Tahquitz Valley and Round Valley. Here during July we found them in fair abundance in the wet, veratrum-covered cienagas, though the birds were inconspicuous, and not readily seen. A large proportion of the specimens secured were caught in mouse traps set for meadow mice and shrews. Early in July, at the time of our arrival at the points where the species was encountered, the young were already out and flying about.

Twenty-two specimens were preserved, twelve adults and ten juvenals, nine from Round Valley (nos. 2097–2102, 2197–2199), and thirteen from Tahquitz Valley (nos. 2916–2928).

Passerella iliaca stephensi Anthony

Stephens Fox Sparrow

Abundant in a comparatively limited area at high elevations. We found it in numbers in Tahquitz Valley, 8000 feet, and in Round Valley, 9000 feet, and a few were noted at a point on the North Fork of the San Jacinto River, near Fuller's Mill, at altitudes varying from 6000 to 7500 feet. This was the lowest point of record in the San Jacintos; we found it nowhere else below 8000 feet. As in the San Bernardino Mountains (see Grinnell, 1908, p. 99), we found the distribution of the species in the San Jacintos to be nearly coextensive with that of the chinquapin (*Castanopsis sempervirens*), the only place where the birds were in different surroundings being near Fuller's Mill. In the higher parts of Santa Rosa Mountain, where the fox sparrows might reasonably be expected to occur, there was no chinquapin, and none of the birds.

By the time we had reached the high altitudes frequented by the species, early in July, the young were out and flying about.

Twenty-seven specimens were collected: Fuller's Mill, two (nos. 2006, 2009), Deer Spring (near Fuller's Mill), two (nos. 2007, 2238), Round Valley, four (nos. 2096, 2212–2214), Tahquitz Valley, nineteen (nos. 2876-2894).

Passerella iliaca schistacea Baird

Slate-colored Fox Sparrow

A sparrow (no. 2008) unequivocally referable to this form was secured at Deer Springs (7500 feet), near Fuller's Mill, on July 3. It has apparently just concluded the molt, with the plumage fresh and glossy, and in striking contrast to the worn, faded condition of the breeding examples of *stephensi* taken at the same time.

The occurrence here of an individual of this subspecies early in July is extraordinary, and the added fact of the unusual plumage condition emphasizes the abnormality of the specimen. Two possibilities present themselves: first, that it had, perhaps, finished breeding and the subsequent change of plumage at an unusually early date, then migrated southward to where it was

taken; second, that through a crippled condition this bird had not been able to travel back north to the regular summer habitat of the subspecies. No indication of injury was in evidence, however.

Whatever the explanation the bird is a perfectly typical example of *P. i. schistacea*, as determined by comparison with extensive series of this form. The normal range of *schistacea* finds its southern limit in the White Mountains, Mono County, California, about 250 miles north of San Jacinto Peak, while another race, *megarhyncha*, occurs in parts of the intervening region.

Pipilo maculatus megalonyx Baird

Spurred Towhee

An abundant and characteristic species in the chaparral of the Upper Sonoran zone, particularly numerous about Kenworthy, and eastward to Vandeventer Flat. A few observed along the stream at Dos Palmos late in May, probably wanderers from the adjacent hills, attracted by the water, as was the case with several other Upper Sonoran species at this point. On the northern slopes of the range the spurred towhee was found ranging downward as far as the abrupt base of the mountains in the San Gorgonio Pass, at Cabezon and Banning, but not out upon the floor of this valley.

On June 11 two nests were found at Oak Tree Spring, between Kenworthy and Palm Cañon. Both were placed in the usual situation, on the ground under over-hanging bushes, and each contained three eggs. A nest with three eggs (no. 61) was taken at Cabezon, May 10, in a very similar situation.

At the time we reached the highest parts of the mountains, the late summer dispersal of birds was well under way, and the spurred towhees had ascended to points probably far above the normal breeding range. Full-grown juvenals were secured near the summit of Toro Peak (8000 feet), July 1, and at Round Valley (9000 feet), July 10.

Twenty-eight specimens were preserved, from the following localities: Cabezon, one (no. 1609), Schain's Ranch, sixteen (nos.

1826–1841), Fuller's Mill, one (no. 1901), Round Valley, one (no. 2211), Strawberry Valley, three (nos. 2613–2615), Kenworthy, two (nos. 2351, 2352), Garnet Queen Mine, two (nos. 2471, 2472), Toro Peak, one (no. 2473), Hemet Lake, one (no. 2976).

Pipilo crissalis senicula Anthony

Anthony Towhee

A common species from the base of the mountains upward through the Upper Sonoran zone. On the western slopes it was one of the commoner birds from Hemet and Vallevista up into Hemet Valley to the vicinity of Kenworthy and Vandeventer Flat. In San Gorgonio Pass it was found in abundance along the foothills at Snow Creek, Cabezon and Banning. On the desert side a number were seen along Carrizo Creek, near Dos Palmos, and in Palm Cañon to its very mouth. The highest point of record was the vicinity of Schain's Ranch, 4900 feet.

Twenty-eight specimens were preserved: Cabezon, eleven (nos. 1662–1671, 1775), Schain's Ranch, three (nos. 1922, 1923, 1925), Poppet Flat, one (no. 1924), Banning, three (nos. 2033–2035), Snow Creek, two (nos. 2066, 2170), Kenworthy, two (nos. 2353, 2354), Dos Palmos, one (no. 2479), mouth of Palm Cañon, one (no. 3052), Hemet Lake, one (no. 2977), Vallevista, three (nos. 3110–3112).

Oreospiza chlorura (Audubon)

Green-tailed Towhee

A common species over practically the same general territory as that occupied by the Stephens fox sparrow, and frequenting the same sort of ground. Abundant in Tahquitz Valley and in Round Valley, while a few were seen in Strawberry Valley and at Fuller's Mill. As was the case with the fox sparrow, the green-tailed towhee was not found on Santa Rosa Mountain. A migrant was taken at the base of the mountains near Cabezon, May 13. The rest of the specimens secured were taken on dates ranging from July 1 to August 4, and a large proportion of them are young birds, some in full juvenile plumage, and others

variously advanced in the post-juvenal molt. An immature female secured August 2 (no. 2873) has already acquired complete first winter plumage.

Thirty-five specimens were collected: Cabezon, one (no. 1625), Fuller's Mill, three (nos. 1898–1900), San Jacinto Peak, one (no. 2093), Round Valley, five (nos. 2094, 2095, 2208–2210), Tahquitz Valley, twenty-three (nos. 2873, 2874, 2895–2915), Strawberry Valley, two (nos. 2643, 2644).

Zamelodia melanocephala capitalis (Baird)

Pacific Black-headed Grosbeak

A common species, except in the highest parts of the range. At Cabezon they were abundant early in May, but apparently did not remain to breed in this region, for by the end of the month the birds had nearly all departed. They were fairly common at Schain's Ranch and Fuller's Mill. In Strawberry Valley during July they were numerous. A few were seen in Tahquitz Valley, wanderers from lower zones, as were probably others observed on Santa Rosa Peak. Several seen on Thomas Mountain, August 16 to 21.

Twenty-six specimens secured: Cabezon, four (nos. 1613–1616); Schain's Ranch, seven (nos. 1792–1798); Poppet Flat, one (no. 1889); Banning, one (no. 2031); Snow Creek, two (nos. 2060, 2061); Santa Rosa Peak, one (no. 2476); Strawberry Valley, six (nos. 2607–2612); Tahquitz Valley, one (no. 2850); Hemet Lake, three (nos. 2980–2982).

Comparison of California specimens of the black-headed grosbeak with a satisfactory series of breeding birds from southeastern Arizona, reveals differences justifying the separate naming of the two races. The California birds, compared with true *melanocephala* of the Rocky Mountain region, have uniformly shorter wing length, smaller bills, and the black of the head invariably interrupted by a more or less distinct post-ocular stripe. The presence of these differences is, of course, no new discovery (see Ridgway, 1901, 618, 619; Grinnell, 1900, 128), but though long acknowledged to exist, the two forms have not

usually been accorded separate names. There seems, however, to be abundant justification for so doing, and Baird's name *capitalis* (1874, p. 70) is available for the California bird.

Guiraca caerulea salicaria Grinnell

California Blue Grosbeak

Seen early in May in some numbers, evidently migrating, at Cabezon, and in the nearby hills at Hurley Flat (3500 feet). One noted at Whitewater, May 26. Birds observed in pairs about Banning the middle of June, were probably nesting nearby. An adult female taken at Hemet Lake, August 10, was the only one of the species encountered so far back in the mountains.

Five specimens were taken: Cabezon, three (nos. 1610–1612), Banning, one (no. 2032), and Hemet Lake, one (no. 2979).

Passerina amoena (Say)

Lazuli Bunting

Fairly common at a few localities in the high mountains, as at Schain's Ranch and Strawberry Valley. After the nesting season stragglers were taken, one at Tahquitz Valley, August 4, another at Carrizo Creek, on the desert side of the mountains, August 26. A nest containing three incubated eggs (no. 79) was found at Strawberry Valley, July 7. It was placed about two feet above the ground in a tangle of rose bushes overhanging a little creek.

Ten specimens were collected: Schain's Ranch, four (nos. 1811–1814), Strawberry Valley, four (nos. 2652–2655), Tahquitz Valley, one (no. 2872), and Carrizo Creek, one (no. 2536).

Piranga ludoviciana (Wilson)

Western Tanager

A fairly common species in the Transition zone. Migrating in some numbers at Hemet, May 19, and at Cabezon during the first two weeks in May. Breeding at Strawberry Valley, where a small juvenal was secured July 8. One or two seen at Garnet

Queen Mine the end of June, an adult male, a straggler, at Tahquitz Valley, July 25, and a number of migrants at Hemet Lake, August 5 to 14, and on Thomas Mountain, August 16 to 21. An adult male was taken on the desert side at Carrizo Creek, August 26, the only one seen at this point. It was still in the summer plumage, having not yet begun to molt.

Six specimens were taken: Strawberry Valley, four (nos. 2627–2630), Hemet Lake, one (no. 2978), Carrizo Creek, one (no. 2480).

Progne subis hesperia Brewster

Western Martin

Abundant in Hemet Valley, where they were breeding in the clumps of yellow pines scattered over the floor of the valley. Especially numerous in the vicinity of Kenworthy. The highest record station in the mountains was Fuller's Mill, 5900 feet, where the birds were fairly common. At Hemet Lake, early in August, many appeared daily, circling about over the surface of the lake.

Thirteen specimens were taken, all adults: Fuller's Mill, three (nos. 1874–1876), Kenworthy, nine (nos. 2333–2341), Hemet Lake, one (no. 2996). The Hemet Lake specimen taken August 11, is just beginning the annual molt.

Petrochelidon lunifrons lunifrons (Say)

Cliff Swallow

Abundant and breeding at many points in the lower parts of the mountains. Large colonies were seen, at that time building nests, in a barn in the town of Hemet, May 18, on a cliff alongside the San Jacinto River road, at about 2000 feet, May 19, and in a deserted mine building at Kenworthy, at the end of May. Many were seen June 13 flying about a rocky gorge in Palm Cañon, at about 3000 feet, where they were probably nesting, and a few on the following day at the mouth of the cañon. Found breeding at Cabezon in May, and at Banning in June. Common at Hemet Lake, August 5 to 14, a large proportion of those seen being young of the year.

Twelve specimens were taken: Cabezon, two (nos. 1714, 1715), Kenworthy, eight (nos. 2325–2332), Hemet Lake, two (nos. 2997, 2998).

Hirundo erythrogastra palmeri Grinnell

Western Barn Swallow

A single bird noted at Deep Cañon, May 31, apparently migrating. At Vallevista, during the first week in September, several were seen passing overhead. One specimen, an immature female (no. 3125), was taken at the latter point.

Tachycineta thalassina lepida Mearns

Northern Violet-green Swallow

An abundant species from about 4500 feet upwards. Seen in some numbers at Kenworthy, where they were nesting in the big pines in the valley. Encountered on Santa Rosa Mountain, from Garnet Queen Mine up to Santa Rosa and Toro peaks. At all the other points visited from Transition upwards, it was one of the commoner species. By the third week in July young birds began to appear on the wing, and in Tahquitz Valley at this time were in large flocks hovering about the meadows. Several violet-green swallows were seen at the summit of San Jacinto Peak, July 27. Sixteen specimens were preserved: Fuller's Mill, six (nos. 1877–1882), Toro Peak, one (no. 2436), Santa Rosa Peak, one (no. 2437), Strawberry Valley, one (no. 2645), Tahquitz Valley, seven (nos. 2749–2755).

Riparia riparia (Linnaeus)

Bank Swallow

Seen at but one point, Hemet Lake, August 5 to 15, during which time several birds were observed. These were probably migrants through the region.

Stelgidopteryx serripennis (Audubon)

Rough-winged Swallow

A flock of about fifteen individuals, supposed to be of this species, seen at Schain's Ranch on June 26. At Hemet Lake, August 5 to 15, migrating rough-winged swallows were noted on several occasions.

Bombycilla cedrorum Vieillot

Cedar Waxwing

A flock of at least fifty seen in pepper trees bordering a street in the town of Hemet on the morning of May 19. The capture of a full-grown juvenal (no. 3001), at Hemet Lake, the morning of August 9, was an unexpected occurrence, difficult of explanation. This bird appeared immediately after an exceptionally heavy storm, and was the only one of the species observed anywhere in the mountains. The capture of this specimen is not in itself evidence of the breeding of the species in the region, for though in the streaked juvenal plumage it was as strong on the wing as any adult, and hence capable of travelling a long distance.

On the other hand, to assume that it had traveled as far as the distance from the nearest known breeding station of the species, northern Oregon, does not seem altogether warranted. It appears more reasonable to believe that the cedar waxwing will eventually be found to breed occasionally in parts of California, though at present not known to do so.

Phainopepla nitens (Swainson)

Phainopepla

Encountered in numbers at various points in San Gorgonio Pass. At Cabezon, during May, they were seen daily, usually in small flocks, and evidently migrating. Also observed at Snow Creek, the end of May, and at Banning, early in June. At the latter point they were probably breeding. The few birds noted at Dos Palmos Spring the last week in May, and at Piñon Flat, June 2, were probably transients, as none were seen at these

points upon subsequent visits late in the summer. A very few were noted in the lower parts of Palm Cañon, one being taken in the cañon at an altitude of about 3000 feet. Seen in numbers at Vandeventer Flat, August 27.

Four specimens were preserved: Cabezon, two (nos. 1724, 1725), Snow Creek, one (no. 2065), Palm Cañon, one (no. 3081).

Lanius ludovicianus gambeli Ridgway

California Shrike

Shrikes do not occur numerously anywhere in the mountains proper, though they are fairly common in the valleys east and north of the range. In San Gorgonio Pass they were moderately abundant eastward as far Cabezon, and decidedly scarce in the desert region beyond. In the vicinity of Dos Palmos and Deep Cañon single birds were several times seen in June and August.

On May 19 a nest was found in Thomas Valley, 4400 feet altitude, not far from the head of Hemet Lake. It contained six eggs, too far advanced in incubation to be saved.

Eight specimens were preserved, as follows: Snow Creek, one (no. 2059), Banning, two (nos. 2026, 2027), Dos Palmos, two (nos. 2477, 2478), Thomas Valley, one (no. 2301), Hemet Lake, two (nos. 2994, 2995).

Vireosylva gilva swainsoni (Baird)

Western Warbling Vireo

Found breeding at several points in high Upper Sonoran or Transition. A nest was discovered at Garnet Queen Mine, June 27, and at Schain's Ranch, June 21, and many of the birds were seen at Fuller's Mill and Strawberry Valley. Migrants were passing through at Cabezon early in May, and at Dos Palmos during the last week in the month. By July 24 they appeared in Tahquitz Valley, beginning to scatter after the nesting period.

Fourteen specimens were taken: Cabezon, one (no. 1741), Snow Creek, one (no. 2158), Schain's Ranch, one (no. 1808), Fuller's Mill, one (no. 2015), Strawberry Valley, four (nos.

2714-2717), Tahquitz Valley, two (nos. 2786, 2787), Vandeventer Flat, two (nos. 2304, 2305), Garnet Queen Mine, one (no. 2445), Dos Palmos, one (no. 2542).

Lanivireo solitarius cassini (Xantus)

Cassin Vireo

Found in fair abundance in such portions of the Transition zone as were visited by our parties. Many were seen at Garnet Queen Mine, the last week in June, and in Strawberry Valley, during July; immature birds appeared in numbers in Tahquitz Valley the latter half of July. Other points of record were Keen's Camp and Schain's Ranch during June. A small juvenal, but recently from the nest, was taken at Garnet Queen Mine, June 26.

Seventeen specimens were collected: Schain's Ranch, two (nos. 1809, 1810), Strawberry Valley, four (nos. 2718–2721), Tahquitz Valley, six (nos. 2780–2785), and Garnet Queen Mine, five (nos. 2446–2450).

Vireo huttoni huttoni Cassin

Hutton Vireo

Encountered at just one point in the region explored, at Garnet Queen Mine, Santa Rosa Mountains, altitude 6000 feet. Here, in high Upper Sonoran, the species was fairly abundant. Five specimens were taken (nos. 2401–2405), three adults in worn plumage and two full-grown juvenals.

Vireo belli pusillus Coues

Least Vireo

An abundant species in suitable portions of the Lower Sonoran zone along the streams in the lower parts of the cañons, where there was sufficient vegetation for shelter. In lower Palm Cañon, the middle of June, they were particularly numerous, from its mouth up to Little Paradise Valley, altitude about 3000 feet. At the mouths of Palm and Murray cañons the least vireos frequented the dense thickets of mesquite and arrowweed. In Little Paradise Valley and at one or two other points in the cañon,

extensive areas grown up with willow and guatemote (*Baccharis glutinosa*) formed their habitat. They were also common along the north base of the mountain, at Snow Creek, Cabezon and Banning, but only at the mouths of the cañons. Found but once on the west slope of the range, along the San Jacinto River road at 2000 feet, where several were seen or heard singing on May 19.

A nest was found at the cañon mouth near Cabezon, which, on May 20, contained three newly hatched young.

Ten specimens of the least vireo were preserved: Cabezon, three (nos. 1738–1740), Palm Cañon, seven (nos. 3069–3075).

Vireo vicinior Coues

Gray Vireo

This was probably the most important single species of bird discovered in the San Jacinto region, because previously little known as a bird of California. This vireo proved to be numerous in a very definite division of the Upper Sonoran zone chiefly on the Pacific side of the mountains. The distribution of *Vireo vicinior* is capable of more exact definition than is usually the case with birds. It is, namely: the Adenostoma minor association, of the Chaparral major association, of the San Diegan faunal division, of the Upper Sonoran zone.

To recount in detail the localities of occurrence: we first met with the species as we entered the region May 19, on the road up San Jacinto cañon, at about 3000 feet altitude. With little doubt a pair were nesting at this point. This was the westernmost record station. On the brushy slopes below Strawberry Valley towards Hemet Valley, 4500 to 5000 feet, and on the opposite lower slopes of Thomas Mountain at about the same altitudes, the presence of the species was repeatedly detected. In the vicinity of Kenworthy, chiefly to the northeast, from 4500 to fully 6500 feet altitude, up over the Hemet Peak ridge, and thence down to the 3000 foot contour towards the head of Palm Cañon, the gray vireo was perhaps fully as conspicuous a member of the Chaparral association as the western gnatcatcher or black-chinned sparrow.

Crossing Palm Cañon, one individual was noted on a ridge at 4200 feet near Potrero Spring and north of Asbestos Moun-

tain, June 13, this being the northernmost station of observation. Along the trail from Vandeventer Flat to Piñon Flat many were noted as far east as Omstott Creek, 4500 feet to 3000 feet, this being also about the limit in that direction of either species of *Adenostoma*. One bird was heard June 23 among the piñons on Piñon Flat, half a mile east of Omstott Creek. Several individuals were noted on a brushy ridge near Garnet Queen Mine at about 6000 feet altitude, this being the most southeastern point of observation.

As already intimated, this vireo is pre-eminently an inhabitant of dry chaparral, thus conflicting in range with no other species of the genus. Along the road below Strawberry Valley, towards Keen's Camp, both this and the western warbling and Cassin vireos were heard simultaneously. The notes of the latter two, however, resounded respectively from the alder-lined ravine bottoms, and from the golden or black oaks of the cool slopes, while the gray vireo sang from the chamissal on the hot, steep slopes near Chalk Hill. At Garnet Queen Mine, both the Hutton and gray vireos were heard from the same stand, the former, however, from the golden oaks, the latter, as usual, from the brush belt adjacent. In upper Palm Cañon, both the gray and the least vireos were noted in one short stretch, the former in some chamissal straggling down the west wall to the lowest limit of its range, the latter species in some guatemote and chilopsis along the stream bed. The presence of no less than five closely related species of one family in so limited a region is obviously closely dependent upon the separate, sharp, associational and zonal preferments of each. The warbling, Cassin and Hutton vireos are arboreal foragers; the least and gray vireos brush foragers; but the least is riparian, while the gray is distinctly a dry-slope forager. We may surmise that the latter species has only been able to find its way into the avifauna of southern California from a Sonoran center of dispersal, through the existence of an associational niche not occupied by another vireo.

It was in the vicinity of Kenworthy that most of our study of the gray vireo was carried on. Here the bird was a constant accompaniment of the belts of the two species of chaparral bushes, *Adenostoma sparsifolium* and *A. fasciculatum*. While

adhering closely to the cover of these plants, it foraged also through scrub oak, manzanita, and ceanothus, occasionally into four-leafed piñon (*Pinus parryana*) or sagebrush (*Artemisia tridentata*). The forage depth of this vireo is between one and five feet above the ground, rarely any higher. A person may follow a bird around for twenty minutes, keeping track of it by the oft-repeated song, without catching a view of it above the level of the chaparral tops.

We estimated that there was a pair of gray vireos for every forty acres of suitable ground, thus giving an unusually large forage area for the individuals of this species. The impression was sometimes given that the population was much more dense, but we decided that the far-carrying song tended to mislead in this regard. Taking the above estimate as conservative, there would be 16 pairs to the square mile. We are of the opinion that there are about thirty square miles of the appropriate association in the San Jacinto region; so that the total number of individuals of this rare bird in the region under treatment was, in 1908, before the advent of the new broods, close to 960.

As already to be inferred, the presence of the gray vireo is most easily ascertainable through the peculiar and far-reaching song. The birds themselves are very difficult to locate, except by means of this song. The truth of this statement will be perceived when it is further stated that after the close of the regular song season, when much of the same ground was repeatedly gone over by members of our parties, between August 5 and 27, but one bird was seen. Only once was the song heard during August, on the 16th, on the trail up Thomas Mountain from Hemet Lake. During the last of May, and June, the song was omnipresent in appropriate localities, from 5:15 A.M. in one case (May 21), to sundown. There seemed to be no cessation during midday.

The song of the gray vireo is loud and full-toned, in volume and quality. In these respects it reminds the hearer strongly of the Cassin vireo, yet with the twang and less deliberate utterance of a western tanager. In measure, and in the suggestion of alternate rising and falling inflection, it recalls the least vireo. No note at all was heard, besides this song, which was apparently

given only by the male. But it is, of course, probable that some sort of a location note, or food call in the case of the young, is possessed by this vireo, as with all other species of the family known to us.

Two nests were found in the vicinity of Kenworthy, both on May 21, each with three eggs, in one case moderately incubated, in the other fresh. The field note account of the discovery of the first nest gives inferential clue to some of the traits of this vireo. After having followed up several singing birds without success, a particular individual was located by its song on a sparsely brushed hillside which gave promise of less difficulty than usual in catching sight of the bird itself. "The song led me up into the brush, and then stopped. After waiting some time, it began again volubly, and I got a glimpse of a vireo as it left a brush-clump and went off up the hillside through the bushes, singing the while. Search disclosed a nest in the upper tangle of a greasewood (*Adenostoma fasciculatum*), with the female bird sitting closely thereon." Three photographs were secured of the nest, and one of the hillside. "The nest was 33 inches (about 850 mm.) above the ground, here sloping, and was discernible for several yards, though well surrounded by the sparsely-leaved greasewood twigs. Many of the latter had to be snapped off in order to obtain uninterrupted view of the nest (see pl. 10, fig. 2). During all this commotion the bird only sat the closer, winking often and occasionally turning her head or twitching her wings. I touched her bill and head several times, and finally picked her bodily from the nest. Meanwhile the male remained at a distance, showing very little concern." It will be observed that the general sequence of incidents is similar to that in one's experience with other species of vireos.

The second nest was found under much the same circumstances. It also was built in a greasewood bush, 36 inches above the ground. The female was sitting, but was not so persistent in remaining as the other, probably due to the shorter proportion of the incubation period so far completed.

Both nests, with their complements of eggs, are preserved in the Museum (sets nos. 74, 75). They are similar to other vireo's nests in shape and semi-pensile attachment. The main

support is at the rims, but their situation among the close-set, obliquely upright, stiffish stems of the greasewood afforded some support by minor twigs (see pl. 10, fig. 2). The measurements of the nests are, respectively, of each of the two nests in each respect: outside diameter, about 76, 73 mm.; inside diameter, 48, 47; outside depth, 54, 59; inside depth, 41, 43. The nests are composed largely of silvery gray weathered grass and plant fibers, usually with the vascular bundles unraveled. Some of these elements were evidently grass blades, some stems of plants, and others the shredded bark of weed-stalks. There is an admixture of tenaceous spider-web, and portions of spider cocoons; on the very outside, in both cases, are many unbroken, tridentate, gray leaves of the sagebrush. Internally the nests are lined with a distinct layer of slender, disintegrated, hair-like fibers of great length, so that the inner surfaces of the nests are firm and smooth, but porous.

The eggs are pure white in color, with numerous abruptly-defined minute dots and spots of not more than one-half millimeter diameter, nearly all agglomerated around the large ends. In color these markings are mostly very dark, of clove brown and sepia tones; a few approach drab. The eggs measure: no. 74: 18.3 x 14.5, 18.7 x 14.0, 18.8 x 14.1; no. 75: 17.8 x 14.7, 17.8 x 14.6, 18.2 x 14.7.

We obtained seventeen specimens of the gray vireo in the San Jacinto region, nos. 2313–2324, 2510, 2511, 3066–3068. All are adults, and all but two (taken with the sets) are males. There are five other skins of adults in the Museum (nos. 3631–3635) collected by F. Stephens, May 13 to 18, 1908, near Campo, San Diego County. One of these is a female, the rest males. With the above unprecedented amount of material at command, it becomes expedient for us to look into the characters of the species, geographical and seasonal. This is especially desirable since a name, *californicus*, has been applied to the California bird as separate from that of Arizona, whence *vicinior* was originally described.

A series of ten specimens was loaned us by the authorities of the United States National Museum; these are from Arizona, New Mexico and Lower California, and include Coues' type, from

Fort Whipple, Arizona. Mr. Frank Stephens kindly loaned several specimens in his private collection, from southern California.

Comparison of the California material with that from Arizona and elsewhere gives at first-glance an impression of color difference. Our San Jacinto series looks clearer gray above and purer white below. But close examination convinces us that the faint dull yellowish suffusion in the National Museum skins is adventitious, due to repeated handling, or to local, natural but extraneous, causes previous to eaptnre. Some old skins in Mr. Stephens's collection from San Diego County, California, present precisely the same appearance. Coues' type of *vicinior* is wonderfully like no. 4465 of the Stephens collection, from Oak Grove, San Diego County. In fact, not the slightest difference in any respect is appreciable, save that the latter is if anything slightly more soiled. Coues's type resembles also no. 2318, Mus. Vert. Zool., but the latter is eleaner white below. There does not appear to be the slightest difference in either proportions or general size; and the range of individual variation is small.

It thus appears that there are no grounds for the systematic separation of the California birds from those of Arizona. This is in aecord with the conclusions of Ridgway (1904, p. 203) from the "few speeimens" at his disposal. In justice to the proposer of the name *californicus* (Stephens, 1890, p. 159), it should be stated that the material available to him at that time was extremely meager; and there certainly are very good geographie grounds to back up any differential peculiarities that might be shown by speeimens. From a consideration of its distribution as now known, it appears probable that the gray vireo has invaded California from the south-central plateau region of western North Ameriea, within relatively recent times.

Our California series of *Vireo vicinior* contains none in juvenal plumage; all are in more or less worn breeding plumage, exeept one. This is an adult male, no. 2316, secured at Vandeventer Flat, August 27, and is in nearly full fresh fall plumage. The annual molt is very nearly completed, only the outermost primaries being still partly unsheathed. Since there is in all probability no spring molt, even partial, this bird presents the

true color characters of the species. As compared with the better known spring plumage, conspicuous among various species of the family for its general plumbeous tone, the freshly acquired plumage is not so distinctly gray save about the head. The whole dorsum, the outer surface of closed wing, and, more appreciably, the rump and upper tail coverts, are pervaded with a tinge of green; the sides and flanks have a conspicuous tinge or mixture of primrose yellow; and there is a faint buffy suffusion across the chest. All these tints are evidently very much reduced, or obliterated altogether, through the intervening months of wear and fading, until spring brings the notable gray cast again.

As far as the records of the species in California show, the gray vireo is only a summer visitant north of the Mexican boundary. It is possible that the apparent scarcity of the gray vireo in the San Jacinto region in August was due in part at least to the early departure of individuals, which had thus already inaugurated the autumnal migratory movement.

Vermivora rubricapilla gutturalis (Ridgway)

Calaveras Warbler

Observed only during the migration in the spring, and at but one locality. Two were seen at Cabezon, May 7, and one of them, an adult female, secured (no. 1769). On May 15 a single bird was noted at the same place.

Vermivora celata lutescens (Ridgway)

Lutescent Warbler

Observed nowhere under circumstances indicative of the breeding of the species in the region explored. In fact, except for a single migrant observed at Cabezon, May 3, none was seen until after the termination of the nesting season. About July 20 they began to appear in Tahquitz Valley, and during the last week of the month were exceedingly abundant there. They were fairly common on Thomas Mountain, August 16 to 21.

Fifteen specimens were collected: Tahquitz Valley, fourteen (nos. 2805, 2815–2827), and Thomas Mountain, one (no. 3035).

The Tahquitz Valley birds are all immature, one or two in juvenal plumage, and one or two in fully acquired first winter plumage, but most of them in the midst of the post-juvenal molt. The Thomas Mountain specimen, collected August 17, is an adult female in fresh winter plumage.

Dendroica aestiva rubiginosa (Pallas)

Alaska Yellow Warbler

In the vicinity of Dos Palmos, May 26 to June 2, migrating yellow warblers were seen daily, usually flitting hastily along through the line of vegetation bordering the creek. Three secured, a male and two females (nos. 2539–2541), proved to belong to this northern subspecies. It seems probable that all of these late migrants were of this form, as at this time the breeding yellow warbler of southern California has already begun nesting.

Dendroica aestiva brewsteri Grinnell

California Yellow Warbler

The vicinity of Cabezon, at the northern base of the mountains, was the only place where yellow warblers were observed in any numbers. They were abundant here during May, and nesting in the neighborhood, as some were noted carrying nest material. But few were seen elsewhere in the mountains. Some were noted at Keen's Camp, July 5, apparently their eastward breeding limit in Hemet Valley, as the species was not encountered at Kenworthy. There were a few in the trees along the streams in Strawberry Valley, where they could be heard singing, though seldom seen.

Other points of record were Snow Creek, Banning, and Fuller's Mill in June, and a few migrants at Tahquitz Valley, July 25 and 28, at Hemet Lake, August 5 to 14, and at Dos Palmos, August 25 and 26.

Fifteen specimens were preserved: Cabezon, nine (nos. 1747–1753, 2126, 2127), Snow Creek, one (no. 2156), Strawberry Valley, two (nos. 2604, 2605), Tahquitz Valley, one (no. 2804), and Dos Palmos, two (nos. 2537, 2538).

Dendroica auduboni auduboni (Townsend)

Audubon Warbler

Seen migrating at Cabezon, at the north base of the mountains, during the first two weeks in May. Later in the summer found breeding numerously in the Transition zone and upwards. Exceedingly abundant in Round Valley, Tahquitz Valley and Strawberry Valley, and downward to a point a little above Schain's Ranch, about 5000 feet altitude. The species was present in the higher parts of the Santa Rosa Mountains, on Santa Rosa and Toro peaks, but not numerous, not more than twelve or fifteen of the birds being seen during a period of several days.

Young birds began to appear in July, and specimens collected during the third week in July were well advanced in the post-juvenal molt. An adult male was taken July 16 in which the annual molt had already begun, apparently about ten days in advance of the majority of the species, as represented by our series.

Thirty-eight specimens were collected, as follows: Cabezon, one (no. 1768), Fuller's Mill, three (nos. 1986–1988), Strawberry Valley, nine (nos. 2617–2625), Tahquitz Valley, thirteen (nos. 2735–2738, 2740–2745, 2766–2768), Round Valley, ten (nos. 2111–2114, 2232–2236, 2739), Toro Peak, one (no. 2458), Santa Rosa Peak, one (no. 2459).

Dendroica nigrescens (Townsend)

Black-throated Gray Warbler

Common in high Upper Sonoran, and in Transition. Here, as elsewhere in the mountains of southern California, closely associated with the golden oak during the nesting period. Abundant at Garnet Queen Mine, June 25 to July 2, full-grown young molting into first winter plumage being secured, and a female seen carrying nesting material at about the same date. A few seen from time to time in the brushy hills above Kenworthy. Numerous and breeding at Fuller's Mill and in Strawberry Valley. They began to appear in Tahquitz Valley the third week

in July, moving upward from lower altitudes. Small juvenals, evidently just from the nest, were taken at Garnet Queen Mine, June 26, and in Strawberry Valley, July 14.

Twenty-three specimens were preserved: Kenworthy, one (no. 2343), Hemet Peak, one (no. 2344), Fuller's Mill, one (no. 1989), Strawberry Valley, eight (nos. 2706–2713), Tahquitz Valley, two (nos. 2757, 2758), Hemet Lake, two (nos. 2999, 3000), Thomas Mountain, one (no. 3033), Garnet Queen Mine, five (nos. 2451–2455), Santa Rosa Peak, two (nos. 2456, 2457).

Dendroica townsendi (Townsend)

Townsend Warbler

Met with but once during the season, an adult female (no. 2342), a migrant, taken at Kenworthy, May 24.

Dendroica occidentalis (Townsend)

Hermit Warbler

Seen but once, an immature male (no. 3034), taken on Thomas Mountain, August 19. Undoubtedly a migrant.

Oporornis tolmiei (Townsend)

Tolmie Warbler

Observed only during the spring migration. At Cabezon, during May, a few were seen almost daily until the 19th. Several were noted at Dos Palmos, in the dense vegetation along the creek, as late as May 27.

Four specimens were secured: Cabezon, three (nos. 1754–1756), Dos Palmos, one (no. 2543).

Geothlypis trichas occidentalis Brewster

Western Yellowthroat

Yellowthroats were fairly common in the vicinity of Cabezon during the first three weeks in May, and at Snow Creek during the ensuing week. From their actions these birds were evidently migrants, as they were generally observed far from water, flitting through the desert brush. The only other place where the species was encountered was at Vallevista, at the western base of the

range. Here a single specimen was taken, again a migrant, shot in a desert wash, miles from the nearest stream.

Three specimens were secured, an adult male at Cabezon, May 19 (no. 1767), an adult female at Snow Creek, May 27 (no. 2157), and an adult female in fresh winter plumage at Vallevista, August 30 (no. 3130).

The male bird, in its small size and dull coloration, is quite different in appearance from the breeding bird of southern California, *G. t. scirpicola*, and it, we believe, should be referred to *occidentalis*. The females of the two forms are not easily distinguished; but as *scirpicola* on the coastal sides of the mountains begins nesting early in April, we are justified in considering the Snow Creek female, taken May 27, migrating, as also being *occidentalis*. Probably all of the migrants traveling along the eastern base of the mountains at this time were of this subspecies.

The Vallevista bird is not with certainty identifiable, but it was evidently a migrant, whereas *scirpicola* is resident in the San Diegan district. Yellowthroats were not found breeding at any point visited by the expedition.

Icteria virens longicauda Lawrence

Long-tailed Chat

Frequently seen during May in the vicinity of Cabezon, and doubtless breeding, as the males were in full song and as individuals could be found frequenting the same places, day after day. One was heard singing in a tangled mass of shrubbery at the mouth of Murray Cañon, near Palm Springs, June 15. Not encountered above the very base of the mountains at these points, and not seen at all at the localities visited on the western slope of the range.

Two specimens were preserved (nos. 1770, 1771), taken at Cabezon, May 7 and 19.

Wilsonia pusilla pileolata (Pallas)

Pileolated Warbler

At Cabezon, during the first three weeks in May, pileolated warblers were of daily occurrence, though not abundant, and

others were seen in the vicinity of Dos Palmos as late as May 27.

Three specimens (nos. 1757–1759) secured at Cabezon on May 7, 13 and 15, are referable to the subspecies *pileolata*, as in all probability is the case with all of these late migrants travelling northward on the eastern side of the mountains.

Wilsonia pusilla chryseola Ridgway

Golden Pileolated Warbler

A pileolated warbler taken at Tahquitz Valley, July 30 (no. 2788) is of this subspecies. Several others, presumably of the same form, were seen in Tahquitz Valley at this time, and on Thomas Mountain, between August 16 and 21.

Anthus rubescens (Tunstall)

Pipit

A single bird seen May 4 in a cultivated field near Cabezon.

Cinclus mexicanus unicolor Bonaparte

Dipper

Several seen near the mouths of the cañons at Cabezon and Whitewater, during May. Other points of record were Fuller's Mill, where several were noted from June 30 to July 5, Strawberry Valley, one seen July 30, and Tahquitz Valley, where single birds were met with occasionally during the last two weeks of July.

Three specimens were preserved, an adult and a juvenal from Fuller's Mill (nos. 1990, 1991), and a juvenal from Tahquitz Valley (no. 2756). The latter, shot July 17, was full grown, and apparently caring for itself, as no adults were with it.

Mimus polyglottos leucopterus (Vigors)

Western Mockingbird

A common species at the western base of the mountains, and in San Gorgonio Pass to the northward. In the latter region mockingbirds were seen commonly at Banning, and in diminishing numbers eastward as far as Cabezon. In the mountains proper but a single individual was encountered, at Thomas Valley, altitude about 4400 feet, on June 6.

The species apparently does not breed at the desert base of the mountains, as none was seen during our visits to the Dos Palmos region and Palm Cañon in May and June. A single bird was observed at Dos Palmos, August 26, probably a wanderer. Mockingbirds were fairly abundant at Vallevista, August 29 to September 5. Here, in common with many other birds, they were feeding largely on the ripe yucca pods, and on the fruit of the cactus.

Two specimens were taken, one at Banning (no. 2030), and one at Vallevista (no. 3105).

Toxostoma redivivum pasadenense (Grinnell)

Pasadena Thrasher

Fairly common in the lower parts of the mountains: on the Pacific side ranging from the base of the range upward through the Upper Sonoran zone, on the desert side downward to the upper edge of Lower Sonoran. Many were seen or heard singing in the brush about Kenworthy, and also at the nearby points, Vandeventer Flat and Oak Tree Spring. From these points they range continuously to the head of Palm Cañon and to the Dos Palmos region. At the latter place birds were seen at various times in May, June and August, usually along Carrizo Creek. In San Gorgonio Pass they were fairly common in the foothills near Banning and Cabezon. In this region, though ranging downward to the extreme base of the mountains, the birds were never seen out in the brush of the valley below.

Our highest record point in the San Jacinto Mountains was the vicinity of Schain's Ranch, altitude 4900 feet. The species was common at Vallevista, at the Pacific base of the mountains. At the time of our arrival in the mountains, at Kenworthy, May 19, full-grown young were already flying about. An immature taken at Vallevista, September 3, has not yet finished the post-juvenal molt.

Eleven specimens were preserved: Cabezon, one (no. 1655), Schain's Ranch, three (nos. 1856–1858), Banning, one (no. 2029), Kenworthy, five (nos. 2251–2255), Vallevista, one (no. 3097).

Toxostoma lecontei lecontei Lawrence

Leconte Thrasher

This desert thrasher ranges westward in San Gorgonio Pass to the vicinity of Banning; but as most of our collecting in this region was carried on at the base of the hills, above the part of the desert floor usually frequented by the species, comparatively few of the birds were seen.

Single individuals were observed at Cabezon on various occasions from May 1 to 19, and at Whitewater, May 30, usually far too wary to admit of near approach. None was seen in the Dos Palmos region, which probably lies somewhat above the normal range of the species, both altitudinally and zonally. Neither were any encountered on the desert below the mouth of Palm Cañon during our brief stay at this point, though they are known to occur in fair abundance in this general region, quite up to the base of the hills.

The one specimen collected, an adult male (no. 1656), taken May 6 at the base of the mountains near Cabezon, is not a normal example of the species, being much darker in coloration than any other specimen in the fairly large series contained in the Museum. This darker coloration is apparent in all parts of the plumage, on the concealed portions of the rectrices and remiges, as well as on the exposed feathers, and it also shows in the slightly darker brownish yellow of the crissum.

There are none but color differences apparent, the bird being of the same size and proportions as typical examples of *lecontei*, but its darker hue is conspicuous in a species in which there is ordinarily so little variation.

The fact that this bird was taken at the western extremity of the range to *T. lecontei*, and at a point where the closely related *T. r. pasadenense* also occurs, together with the fact that its coloration distinctly approaches that of the latter species, suggest the possibility of its being an intergrade or a hybrid between the two forms. *Lecontei* was formerly regarded as a subspecies of *T. redivivum*, a belief that has been rejected of late years; but in color at least, this specimen comes near to bridging the gap between the two.

Heleodytes brunneicapillus couesi (Sharpe)

Northern Cactus Wren

A fairly common species at many points in the Lower Sonoran brush land at the base of the mountains, both on the Pacific and the desert sides. At the mouth of Palm Cañon, and at Dos Palmos in June and again in August, they were seen, though in small numbers, and those observed were exceedingly wild. In San Gorgonio Pass, at Cabezon, Whitewater, Snow Creek and Banning, this was one of the typical birds of the chaparral. About Vallevista, at the western base of the mountains, many were seen during the first week in September.

Nests were found as follows: At Cabezon, May 5, with two young, May 13 with four eggs, and May 15 with four eggs; at Dos Palmos, June 1, with three eggs. The breeding season is of long duration, as, although young were found in the nest early in May, others but little older were taken near the end of August.

Twenty-four specimens were collected: Mouth of Palm Cañon, one (no. 3065), Dos Palmos, four (nos. 2481–2484), Cabezon, six (nos. 1716–1719, 1773, 1774), Snow Creek, four (nos. 2056, 2058, 2154), Banning, four (nos. 2022, 2025), Vallevista, five (nos. 3099–3103).

Salpinctes obsoletus obsoletus (Say)

Rock Wren

We recorded the rock wren at but few places in the San Jacintos, though there were some of these localities where it occurred in fair abundance. Several were seen at Kenworthy during May. In Palm Cañon, the middle of June, the birds were seen from 3000 feet down to the mouth of the cañon, and two full-grown juvenals were taken. About Dos Palmos and in Deep Cañon, during the last week in August, they were numerous.

Three specimens were preserved: Kenworthy, one (no. 2265), Palm Cañon, two (nos. 3063, 3064).

Catherpes mexicanus punctulatus Ridgway

Dotted Cañon Wren

Although cañon wrens were not really abundant anywhere, we found them where suitable ground existed, in all parts of the mountains from the floor of the desert to the summits of some of the highest peaks. A large proportion of the specimens collected, however, were wandering juvenals, and it may very well be that the breeding adults are much more circumscribed in their summer habitat.

They were most numerous in the rocky cañons on the desert side of the range. In Palm Cañon they were seen from the desert below up nearly to Vandeventer Flat; about Dos Palmos and in Deep Cañon they were encountered in some numbers in June and August; and occasional birds were noted along the base of the mountains at Cabezon, Snow Creek, and Banning. In the higher altitudes birds were seen at Kenworthy in May, in Tahquitz Valley in July, and on the summit of Toro Peak, July 1.

Though so exclusively rock dwellers that it is generally useless to search for them amid other surroundings, cañon wrens were several times seen feeding in unusual places. Near Potrero Spring, in Palm Cañon, June 13, one was observed feeding in the branches of a piñon. At the mouth of Palm Cañon they were sometimes noted in the tops of the palm trees, dodging in and out of the downturned masses of dead leaves.

A bird heard singing near the head of Palm Cañon, June 12, when followed up and secured, proved to be a male in juvenal plumage. The song was similar to that of the adult, but softer and more subdued.

Fourteen specimens were taken, as follows: Snow Creek, four (nos. 2071, 2136–2138), points in Palm Cañon, seven (nos. 3056–3062), Toro Peak, one (no. 2465), Hemet Lake, one (no. 3006), Round Valley, one (no. 2231). Only three are adults, the remainder being all in the juvenal plumage.

Thryomanes bewicki charienturus Oberholser

San Diego Wren

Breeds in abundance everywhere in the Upper Sonoran chaparral belt of the mountains. At Kenworthy, Dos Palmos, Cabezon, and Snow Creek, in May, and at Palm Cañon, Garnet Queen Mine, Banning, and Schain's Ranch, in June, it was one of the commoner species in the brush. In midsummer, when the young birds were out, they appeared in great numbers in the higher parts of the range. In August they were noticeably abundant on the drier, brush-covered ridges surrounding Tahquitz Valley; by "squeaking" for but a few moments one could have a score of these and the house wrens gathered around. Many were observed in Round Valley, and, on each of the several occasions on which members of the expedition ascended San Jacinto Peak, San Diego wrens were seen on or very near the summit. They were fairly numerous on Thomas Mountain, August 16 to 21, at Dos Palmos, August 23 to 27, and at Vallevista, August 29 to September 5.

Full-grown juvenals appeared during the last week in May, and one bird still in juvenal plumage was taken at Vallevista August 30. Immatures in first winter plumage, and adults also finished with the fall molt, were collected at Dos Palmos, August 26, and at Vallevista August 30.

Thirty-two specimens were collected: Cabezon, three (nos. 1736, 1737, 2128), Snow Creek, one (no. 2135), Schain's Ranch, six (nos. 1949–1954), Kenworthy, two (nos. 2283, 2284), Garnet Queen Mine, five (nos. 2396–2400), Omstott Creek, one (no. 2512), Dos Palmos, three (nos. 2513–2515), Palm Cañon, three (nos. 3087–3089), Strawberry Valley, one (no. 2626), Tahquitz Valley, two (nos. 2806–2807), San Jacinto Peak, one (no. 2230), Vallevista, four (nos. 3106–3109).

Troglodytes aëdon parkmani Audubon

Western House Wren

A fairly common species in the mountains, and met with by us at every point visited; but as the higher parts of the range were explored by us rather late in the summer, when the fall dis-

persal was under way, we did not ascertain the definite breeding limits of the species. Adults were seen feeding young out of the nest, at Kenworthy, on June 8. None was observed at Dos Palmos in May and June, and probably they do not breed in that vicinity; at the end of August several were seen there. One or two were noted at the base of the mountains at Cabezon, early in May, the only point on the desert side where the species appeared to be breeding. There were a few at the Garnet Queen Mine, in June, and two were seen on the summit of Santa Rosa Peak, June 30. At other high mountain points, Strawberry Valley, Tahquitz Valley, and Round Valley, in July, they were exceedingly numerous, the majority of those collected being young birds. They were fairly abundant on Thomas Mountain, August 16 to 21.

A juvenal collected in Round Valley, July 10, is beginning to molt into winter plumage. One taken on Thomas Mountain, August 18, has completed the change.

Thirty-two specimens were collected, from the following points: Schain's Ranch, four (nos. 1955–1958), Fuller's Mill, two (nos. 2011, 2012), Strawberry Valley, seven (nos. 2689–2695), Tahquitz Valley, seven (nos. 2808–2814), Round Valley, ten (nos. 2103, 2104, 2222–2229), Kenworthy, one (no. 2279), Thomas Mountain, one (no. 3032).

Certhia familiaris zelotes Osgood

Sierra Creeper

We found the creeper only at points in the Transition zone and upwards, and in but very limited numbers. In the Santa Rosa Mountains a few were seen near the summits of Santa Rosa and Toro peaks, probably not more than five or six altogether. Two broods were encountered in Strawberry Valley early in July, and a few were noted in Tahquitz and Round valleys at various times; but the species was never at all abundant.

On Santa Rosa Peak, June 28, one was seen to alight upon the face of a vertical rock, and ascend to the summit as if on the trunk of a tree, searching the crevices for insects.

Sixteen specimens were collected: Fuller's Mill, two (nos. 2013, 2014), Strawberry Valley, four (nos. 2702–2705), Tahquitz Valley, four (nos. 2769–2771, 2774), Round Valley, four (nos. 2118, 2772, 2773, 2775), Santa Rosa Peak, two (nos. 2434, 2435).

Sitta carolinensis aculeata Cassin

Slender-billed Nuthatch

A fairly common species in parts of the mountains, being confined largely to the Transition zone. In the Santa Rosa Mountains we found them abundant at the Garnet Queen Mine, many juvenals being out and feeding in the trees at the time of our stay here, June 25 to 28; but higher up, near the summit of Santa Rosa and Toro peaks, but very few were seen. They were occasionally observed at Fuller's Mill and Schain's Ranch; a little higher up, at Strawberry Valley, they were more common. At still higher altitudes, in Tahquitz and Round valleys, although of daily occurrence, they were in smaller numbers. On Thomas Mountain, the middle of August, they were abundant.

Twenty-one specimens were collected: Schain's Ranch, four (nos. 1959–1962), Fuller's Mill, four (nos. 1978–1981), Strawberry Valley, three (nos. 2699–2701), Tahquitz Valley, two (nos. 2746, 2747), Round Valley, one (no. 2179), Garnet Queen Mine, six (nos. 2368–2373), Thomas Mountain, one (no. 3024).

Sitta canadensis Linnaeus

Red-breasted Nuthatch

Occurs in small numbers in the limited area of Canadian zone in the highest parts of the mountains, the only places where we found them being in Tahquitz Valley and Round Valley. In Tahquitz Valley one was heard calling August 4. In Round Valley during July they were heard calling on various occasions, but from their habit of remaining in the tops of the tallest trees, it was almost impossible to catch sight of them. But one specimen was secured, an adult male (no. 2196) taken in Round Valley, July 9.

Sitta pygmaea leuconucha Anthony

White-naped Nuthatch

A common species in the Transition zone and upwards. In the Santa Rosa Mountains it was noted from the Garnet Queen Mine up, being abundant in the open pine forests on the higher slopes of Santa Rosa and Toro peaks. In the San Jacinto Mountains proper it was encountered at Schain's Ranch and Fuller's Mill, and in greater numbers in Strawberry Valley, Tahquitz Valley and Round Valley. At the time we entered the altitudes frequented by this nuthatch, the third week in June, the young had already left the nest, and small flocks of parents and young together were met traveling through the woods. One or two small flocks were seen at Hemet Lake the middle of August.

Nineteen specimens were collected, as follows: Fuller's Mill, four (nos. 1982–1985), Strawberry Valley, five (nos. 2631–2635), Tahquitz Valley, one (no. 2748), Round Valley, three (nos. 2105, 2180, 2181), Santa Rosa Peak, four (nos. 2439–2442), Toro Peak, one (no. 2443), Hemet Lake, one (no. 3005).

The San Jacinto pygmy nuthatches clearly exhibit the size characters of *leuconucha*. Compared with typical *pygmaea* from Monterey Bay they are larger, with especially larger bill. The birds from all of the southern California mountain ranges, at least from the Sierra San Gabriel southward, resemble in their dimensions the Lower California form rather than the northern subspecies.

Baeolophus inornatus murinus Ridgway

San Diego Titmouse

Most abundant on the desert slopes, but occurring also on the western side of the mountains, where it was encountered at various points up to 6000 feet. At Kenworthy, June 3, a pair of the birds were seen carrying insects into an old woodpecker hole thirty feet above the ground in a dead pine. At Garnet Queen Mine, the last week in June, flocks of old and young together were feeding in the trees. Other points of record are Vandeventer Flat, Schain's Ranch, Strawberry Valley and Vallevista.

Twelve specimens were collected: Schain's Ranch, three (nos. 1784, 1785, 1972), Strawberry Valley, three (nos. 2696, 2698), Kenworthy, one (no. 2278), Garnet Queen Mine, four (nos. 2391–2394), Palm Cañon, one (no. 3090).

Penthestes gambeli baileyae (Grinnell)

Bailey Mountain Chickadee

In the Transition zone and upwards, this was one of the most abundant species of birds in the mountains. By the time we first reached their haunts, during the last week in June, the young were already flying about, and, attended by their parents, were conspicuous everywhere in the woods. In the Santa Rosa Mountains, both at the Garnet Queen Mine and at the summit of the range, this chickadee was the commonest species of bird. In the San Jacinto Mountains proper, from about 5000 feet upwards, they were also exceedingly numerous, being noted in the hills above Kenworthy, and at Fuller's Mill, Schain's Ranch, Strawberry Valley, Tahquitz Valley, Round Valley, and Thomas Mountain, and it was one of the species noted on the summit of San Jacinto Peak (10,700 feet), July 27. An immature male taken on Thomas Mountain, August 17, has completed the post-juvenal molt.

Forty specimens were preserved, as follows: Garnet Queen Mine, six (nos. 2363–2365, 2376, 2381, 2382), Santa Rosa Peak, four (nos. 2377–2380), Fuller's Mill, five (nos. 1973–1977), Schain's Ranch, five (nos. 1931–1935), Strawberry Valley, eight (nos. 2596–2603), Tahquitz Valley, five (nos. 2796–2800), Round Valley, six (nos. 2116, 2117, 2202–2205), Thomas Mountain, one (no. 3025).

Psaltriparus minimus minimus (Townsend)

California Bush-tit

A common species in the scrub oak and chaparral of the lower parts of the mountains. On the desert side they were fairly abundant on Piñon Flat and at Dos Palmos. On the Pacific side we saw many at Kenworthy; and in the Santa Rosa Mountains as high as the Garnet Queen Mine, in the San Jacintos

as high as Strawberry Valley and, later in the summer, the summit of Thomas Mountain. A young bird taken in Round Valley, 9000 feet, July 11, and a flock seen on the ridge above Tahquitz Valley, 8000 feet, July 30, were undoubtedly summer wanderers from lower altitudes. At the San Gorgonio Pass side of the range they were found down to the very base of the mountains, but not out on the floor of the desert. Near Vallevista, at the western base, they were of common occurrence during the first week in September.

A nest was found at the base of the mountains near Cabezon, May 6, presumably with eggs, as one of the parent birds was occupying it. At Dos Palmos, May 28, and at Kenworthy, June 4, flocks of old and young together were seen foraging through the shrubbery.

Twenty-one specimens were collected: Cabezon, eight (nos. 1732–1735, 2121–2124), Banning, one (no. 2050), Hurley Flat, two (nos. 1806, 1807), Kenworthy, two (nos. 2280, 2281), Dos Palmos, four (nos. 2529–2532), Strawberry Valley, two (nos. 2650, 2651), Round Valley, one (no. 2185), Vallevista, one (no. 3132).

Auriparus flaviceps flaviceps (Sundevall)

Verdin

A few verdins were seen daily at the mouth of Palm Cañon and on the desert below, June 14 to 17. Several nests were discovered in mesquite thickets at this point, some of them with the birds close at hand, but none containing either eggs or young. The species was not observed at Dos Palmos during our visits there in May and June, but later in the season, in August, several were encountered in the shrubbery along the creek. These two desert localities were the only record stations in the region.

Four specimens were collected, an adult male (no. 3083) and a non-sexed juvenal (no. 3082) from the mouth of Palm Cañon, June 15, and two juvenals from Dos Palmos, August 23 and 26 (nos. 2527, 2528). The two latter are in the midst of the post-juvenal molt, with the yellow head and chestnut wing coverts partly acquired.

We found them most elusive birds, hard to secure, or even to catch sight of, flitting through the bushes with hardly a sound; while the vegetation was so whipped about by the hard winds prevailing, that any small birds were extremely difficult to see.

Chamaea fasciata henshawi Ridgway

Pallid Wren-tit

A common species in the chaparral throughout the mountains. On the San Gorgonio Pass side of the range the wren-tit, together with several other species of the same association, ranges down quite to the base of the hills, where it stops abruptly, not venturing out on the nearby desert floor. At Dos Palmos, about the point of mergence of the Upper and Lower Sonoran zones, an occasional brood was seen wandering down from the brush to the pools in the cañon below. The birds were common at the Garnet Queen Mine, the upper limit of the brush belt in the Santa Rosa Mountains. Throughout Hemet Valley, from Vandeventer Flat to Hemet Lake, and from there on down the San Jacinto River road clear to the base of the mountains at Vallevista, the call of the wren-tit was the most familiar and often heard bird note. In the late summer they were found straying upwards far above their breeding ground. One was seen on the Tahquitz trail at about 8000 feet, July 17, and on July 22 one was heard near the summit of Tahquitz Peak, 8826 feet. The upper limit of the breeding range in the San Jacinto Mountains is probably in the neighborhood of 6000 feet.

Eleven specimens of the wren-tit were secured, from the following points: Cabezon, three (nos. 1645, 2119, 2120), Banning, one (no. 2049), Schain's Ranch, one (no. 1805), Kenworthy, one (no. 2277), Hemet Lake, one (no. 3007), Garnet Queen Mine, one (no. 2366), Dos Palmos, one (no. 2533), Vallevista, two (nos. 3128, 3129).

Regulus satrapa olivaceus Baird

Western Golden-crowned Kinglet

Seen on several occasions in Tahquitz Valley and in Round Valley. They were first noted on July 26, when a small flock, probably a single family, was encountered in some willows border-

ing a cienaga in Tahquitz Valley. Two juvenals were secured, the rest taking refuge in the tree tops, where they easily eluded observation. The next day, July 27, another flock was seen in Round Valley, but in the tops of the pines out of reach. On July 29 one was taken in Tahquitz Valley. The first two specimens (nos. 2792, 2793), both females, are in juvenal plumage throughout. The last (no. 2795) is a young male molting into first winter plumage. The capture of these birds in the manner described is undoubtedly indicative of their breeding at this point. The southernmost breeding station previously recorded for California is the San Bernardino Mountains (Grinnell, 1908, p. 126), and the present instance carries the breeding range southward to the southernmost extension of the Boreal zone within the state.

Regulus calendula cineraceus Grinnell

Ashy Kinglet

In Tahquitz Valley and in Round Valley, during July, kinglets were seen or heard almost daily, and the species probably breeds in fair abundance everywhere on the higher slopes leading up to San Jacinto Peak, from about 8000 feet upward. From their habit of frequenting the tree tops the birds were not easily or frequently observed, but the loud, clear song was evidence enough of their presence. After the young had left the nest they were more frequently seen in the willow thickets bordering the cienagas and streams.

Three adults were taken in Round Valley, July 8 and 11 (nos. 2182–2184). Two juvenals were taken in Tahquitz Valley, July 28 and 29 (nos. 2791, 2794), one in juvenal plumage throughout, the other with new feathers appearing on the throat and breast. Two were secured in Round Valley, August 2, a young male (no. 2789) just beginning the post-juvenal molt, and an adult female (no. 2790) which was in the midst of the annual molt.

Polioptila caerulea obscura Ridgway

Western Gnatcatcher

An abundant species in the Upper Sonoran chaparral on the Pacific side of the mountains. About Kenworthy, at the end of May and early in June, they were noticeably numerous, probably

the most abundant species of bird, in full song, and undoubtedly breeding in the neighborhood. At Dos Palmos, on the desert side, occasional individuals appeared about the springs, but these had probably strayed down from the waterless Upper Sonoran chaparral slopes above. In the Santa Rosa Mountains one or two were seen at Garnet Queen Mine, and two individuals near the summit of Santa Rosa Peak, June 29.

The upper limit of the species in the San Jacinto Mountains may perhaps be indicated by its occurrence in fair abundance at Sehain's Ranch (4900 feet), in lesser numbers at Fuller's Mill (6000 feet), and a single bird at Idyllwild (6000 feet), seen July 3. During the first week in May they were common at Cabezon, at the northern base of the mountains, but they may well have been migrating at that time, and no evidence was forthcoming of their breeding in the vicinity.

At Hemet Lake during the first two weeks in August gnatcatchers were migrating in large numbers, and on Thomas Mountain (6800 feet), during the ensuing week, they were also fairly numerous.

Twelve specimens were taken, from the following points: Cabezon, one (no. 1742), Sehain's Ranch, three (nos. 1802–1804), Fuller's Mill, one (no. 2016), Kenworthy, six (nos. 2270–2275), Hemet Lake, one (no. 3004).

Polioptila plumbea (Baird)

Plumbeous Gnatcatcher

Several were observed and an adult male secured (no. 3091), in a clump of desert willow between the mouths of Palm and Murray cañons, June 15. About Dos Palmos during the third week in August, gnatcatchers were occasionally seen in the brush, and the two specimens secured (nos. 2534, 2535), both in the juvenal plumage, proved to be of this species. These were the only occasions on which the species was encountered in the region.

Polioptila californica Brewster

Black-tailed Gnatcatcher

In the San Jacinto region this species proved to be confined strictly to the Lower Sonoran zone at the western and northern bases of the range, occurring nowhere above the very lowest foot-

hills. It was found in May and June at Banning and Cabezon north of the range in San Gorgonio Pass. The latter place is about at the point where the Pacific flora and fauna gives place to desert species, and the black-tailed gnatcatcher is here at the eastern limit of its range, being replaced farther on by *P. plumbea*. In the brush about Vallevista, at the western base, it was one of the most abundant species.

Seven specimens were collected: Cabezon, two (nos. 1743, 1744), Vallevista, five (nos. 3133–3137). Adults and young taken at the latter point August 29 to September 5, have about completed the fall molt.

Hylocichla ustulata ustulata (Nuttall)

Russet-backed Thrush

Occurs in San Jacinto Mountains apparently as a migrant only. At the northern base of the range, at Snow Creek and Cabezon, during May, it was found passing through in some numbers. At Dos Palmos, during the last week in May, one or two were seen or heard daily in the vegetation along the stream. It was not encountered at any higher point in the mountains.

Six specimens were collected: Cabezon, four (nos. 1720–1723), Snow Creek, one (no. 2159), Dos Palmos, one (no. 2509).

Sialia mexicana occidentalis Townsend

Western Bluebird

We found bluebirds in fair abundance in the mountains at many points from 4500 feet upwards. At Kenworthy, the last week in May, they were seen daily, at this time already feeding young out of the nest. In the Santa Rosa Mountains, the last of June, we found them in some numbers from the lower edge of Transition (Garnet Queen Mine) up to the summit. On the desert side of the range the only ones noted were a pair seen in the upper part of Palm Cañon, at about 3000 feet, June 12, probably wandered down from the higher slope to the westward, attracted by the water in the cañon. In the higher parts of the San Jacinto Mountains, at Schain's Ranch, Fuller's Mill,

Strawberry Valley, Tahquitz Valley and Round Valley, bluebirds were encountered in abundance during June and July. In August numerous flocks were seen at Hemet Lake and on Thomas Mountain. Young, still in juvenal plumage throughout, were taken up to the middle of August. Adults and young collected on Thomas Mountain during the third week in August are in the midst of the fall molt.

Fifty-one specimens were collected, as follows: Fuller's Mill, four (nos. 1883, 1884, 1887, 1888), Poppet Flat, three (nos. 1885, 1886, 1946), Schain's Ranch, twelve (nos. 1936–1945, 1947, 1948), Strawberry Valley, fourteen (nos. 2675–2688), Tahquitz Valley, one (no. 2759), Round Valley, five (nos. 2085, 2176–2178, 2264), Hemet Lake, three (nos. 2991–2993), Thomas Mountain, three (nos. 3021–3023), Kenworthy, four (nos. 2266–2269), Garnet Queen Mine, one (no. 2367), Toro Peak, one (no. 2444).

The bluebird of southern California has of late been considered by some writers to be the same as the Lower California form, *Sialia m. anabelae*, and we have therefore carefully scrutinized our series of specimens for verification of this belief. No examples of true *anabelae* from the San Pedro Martir Mountains are available; but the Museum contains extensive series of breeding birds from the mountains of San Diego, Riverside, San Bernardino and Los Angeles counties and the Sierra Nevada, and small series from northern California, and from Vancouver Island. Measurements and coloration of these various series have been carefully compared, and the results do not seem to justify the recognition of a race in southern California distinct from *occidentalis*.

Occidentalis, compared with *anabelae*, shows the following characteristics: smaller size, with relatively smaller and more slender bill; adult male with blue of a different shade and with the chestnut areas of back and breast much more extensive.

Of twenty-three breeding males from the San Jacinto Mountains, twenty-one have the chestnut area on the breast extensive and continuous; in two it is divided by a narrow line of blue. Sixteen have the chestnut dorsal patch solid and extensive, and seven have it divided by blue interscapulars.

Five breeding males from Vancouver Island show much less chestnut on back and breast. Two have chestnut patch of small size on the dorsum, one has slight streaks on the scapulars, one but a few faint flecks of chestnut on the scapulars, and two are pure blue above. None have the underparts as extensively chestnut as the average southern California bird, and in each there is a tendency for this tract to be divided into two patches. Five males from the Warner Mountains, and two from Shasta County, also show this restriction of the chestnut areas, quite as much so as individuals from southern California which have been referred to *anabelae*. Thus these northern birds, which may be considered typical *occidentalis*, do not by any means show a greater extension of chestnut markings, one of the supposed characteristics of this race.

As already noted by Grinnell (1908, p. 133) wear has a great deal to do with the extent of the chestnut, freshly molted specimens invariably showing it much more extensively than others. The shade of the blue is variable in any series, the five Vancouver Island specimens showing as great extremes as do the San Jacinto birds. Comparative measurements are given below.

On the whole, we have not been able to find grounds for recognizing a form *anabelae* as occurring in California. The characters ascribed to the subspecies are so elusive and unstable, and the variation, especially in coloration, in series from any one region is so great, that the use of separate names for northern and southern California birds does not seem to serve any useful purpose, but is merely confusing. We accordingly use the older name, *occidentalis*.

Comparative measurements in millimeters (minimum, maximum, and average) of *Sialia m. occidentalis* from California and Vancouver Island

	wing
5 males from San Diego County, Calif.	107 –110 (109.0)
20 males from San Jacinto Mts.	98.5–109.5 (105.9)
5 males from Sierra Nevada, Kern Co., Calif.	100.5–107 (103.5)
2 males from Shasta Co., Calif.	103.5–106 (104.7)
4 males from Modoc Co., Calif.	101.5–106.5 (103.9)
5 males from Vancouver Island	101 –108 (105.5)

9 females from San Jacinto Mts., Calif.	99.5–107.5	(103.8)
8 females from Modoc Co., Calif.	88 –104	(100.2)
5 females from Vancouver Island	99 –102	(100.6)

CULMEN

5 males from San Diego County Calif.	12 – 13	(12.5)
20 males from San Jacinto Mts., Calif.	11.5– 13	(12.4)
5 males from Sierra Nevada, Kern Co., Calif.	10.5– 13	(11.6)
2 males from Shasta Co., Calif.	11 – 12	(11.5)
4 males from Modoc Co., Calif.	11 – 12.5	(11.8)
5 males from Vancouver Island	11 – 12	(11.3)
9 females from San Jacinto Mts., Calif.	12 – 13.5	(12.8)
8 females from Modoc Co., Calif.	10.5– 12.5	(11.5)
5 females from Vancouver Island	10.5– 13	(11.7)

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GENERAL ACCOUNTS OF THE MAMMALS

Odocoileus hemionus californicus (Caton)

California Mule Deer

Sign was seen plentifully in nearly all parts of the Upper Sonoran chaparral belt, and thence up through Transition, both on Santa Rosa and the main San Jacinto Mountain. On the San Gorgonio Pass side no evidence of the presence of deer was seen below Schain's Ranch, 4900 feet. Here and at Fuller's Mill a few tracks were seen, and a buck was jumped at the latter place June 30. In Strawberry Valley a doe with two fawns was seen July 7. In the vicinity of Tahquitz Valley, 8000 feet, during July and August, fully a dozen deer were seen, one being an old buck, the rest yearling bucks, does, and fawns. During the middle of the day the deer were staying on the sides of the low ridges margining the valley, mostly at the upper edge of the brush-patches, where these gave place to thickets of small firs interspersed with open stretches. Many beds were to be seen beneath young firs or pines, merely irregular bare places about two feet across scraped in the carpeting of pine needles. There are never any feces in or close about deer beds as there always are in the case of sheep. An occasional bed was situated on the crest of a ridge, but as a rule the animals selected locations down on the slope below, within fifty yards of the crest.

About the margins of the thickets of *Ceanothus cordulatus*, the numerous footprints showed plainly how the deer had stood and browsed. There were plenty of places where the new growth of this plant had been nibbled off. Heaps of feces along these feeding places showed that the deer defecate while browsing. In the stomach contents of a deer shot in this vicinity the only identifiable material consisted of leaves and newly grown twigs of *Ceanothus cordulatus;* it would seem that this is the chief, if not the only plant foraged upon in the Transition zone at this season.

No definite evidence was forthcoming that the deer ate grass in the meadows. Tracks showed that the streams and meadow margins were often visited, but we thought solely for water. In

one case three deer were seen in the evening standing out in an open meadow hardly one hundred yards from a band of grazing horses. The latter appeared to cause the deer no uneasiness. As far as we observed, however, the deer were not themselves grazing. Deer trails beaten into plain thoroughfares led across heads of ravines and over ridges diagonally, but seldom followed directly along the top of a ridge for any distance.

In the vicinity of Round Valley, 9000 feet, four deer were seen; sign was noted July 27 up the brushy side of San Jacinto Peak above Round Valley to an elevation of about 9800 feet, this being practically at the upper limit of *Ceanothus cordulatus*. Deer thus range in summer over the highest parts of the mountains, there being no apparent zonal limitation.

On Thomas Mountain and on the chaparral slopes in the vicinity of Hemet Peak and Oak Tree Spring above Kenworthy, sign was plentiful. On the Santa Rosa Mountains evidences of the presence of deer were not notably numerous, though the animals ranged over the whole ridge. But down on the northeast slope in the piñon belt sign was plentiful. On Sheep Mountain, about the head of Deep Cañon and across Piñon Flat to the upper walls of Palm Cañon deer were numerous. The lowest place of occurrence was at Potrero Spring, 3500 feet, near Asbestos Mountain; here one was seen June 13.

Hunting of deer is persistently carried on through each open season, and it is surprising that there are many deer left in such a limited area as is the portion of the San Jacinto region suitable to the animal's needs. Their survival is doubtless due to the large areas of heavy chaparral, which afford cover, and in many places freedom from pursuit with dogs.

Our parties procured three specimens: a two point buck (no. 2336) with horns in the velvet, near Toro Peak June 29; an old doe (no. 2338) in Tahquitz Valley, July 24; and a spotted fawn, female (no. 2337), Thomas Mountain, August 20.

Ovis canadensis nelsoni C. H. Merriam

Desert Bighorn

The desert sheep or bighorn was found to occupy a definite area on the desert slope of the region chiefly below the piñon

belt, and therefore not much overlapping the habitat of the mule deer. The range of the agave and desert sheep in this region closely coincided. Sign was first seen on the west wall of the upper Palm Cañon at about 3500 feet altitude, thus on the east base of Hemet Peak. It is probable that the sheep range from here almost continuously north along the precipitous east and northeast base of the main San Jacinto ridge at least to Chino Cañon, for in February, 1912, definite information was obtained to the effect that several had been seen in lower Tahquitz Cañon close to Palm Springs, and in lower Chino Cañon.

To the east of Palm Cañon sign was observed widespread over the hills below the 3500 foot contour. On the east slope near Little Paradise, on the ridges north of Asbestos Mountain, a few individuals had wandered within the few days previous to June 17, 1908. This was also the case on and around Black Mountain. But it was the immediate vicinity of Deep Cañon which, in May, June and August, 1908, was the metropolis of the sheep. On the steep walls and nearby mesa a few hundred yards back from the rim, 2500 to 4000 feet altitude, well worn trails, footprints, and feces were plentiful. In places it looked as though a herd of domestic sheep had been over the region. A lone ram was seen on the side of Deep Cañon on May 27; a band of twelve together, on May 28, a band of ten on June 19, a band of four on August 24, a lone ram on August 25.

Two specimens were obtained: a ram of about six years of age (no. 2319) June 19, and a ewe of about two years (no. 2320), August 24.

Sciurus griseus anthonyi Mearns

Anthony Gray Squirrel

Not a common species in the mountains, and seen only in the higher parts of the range, from one or two points in high Upper Sonoran upwards. Specimens were collected as follows: Round Valley, 9000 feet, two (nos. 1758, 1759); Strawberry Valley, 6000 feet, one (no. 2087); Thomas Mountain, 6800 feet, one (no. 2216); Kenworthy, 4700 feet, one (no. 2309); Garnet Queen Mine, 6000 feet, one (no. 2310). Additional points of record are

Santa Rosa Peak, Tahquitz Valley, and the road between Schain's Ranch and Fuller's Mill. It was not an abundant species at any point, two or three individuals being about as many as were seen anywhere in the course of a day's collecting.

The six specimens preserved, all adults, taken on dates ranging from June 5 to August 17, are in extremely worn and ragged pelage, some of them showing the beginning of the growth of new hair on the head, and at points on the back.

Eutamias merriami merriami (Allen)

Merriam Chipmunk

A common species on the coastal slope of the mountains, mostly in high Upper Sonoran and lower Transition, ranging upward in smaller numbers to upper Transition. Specimens were collected as follows: Poppet Flat, 4000 feet, two (nos. 1645, 1668); Schain's Ranch, 4900 feet, six (nos. 1643, 1644, 1646, 1647, 1669, 1670); Fuller's Mill, 6000 feet, ten (nos. 1745–1754); Strawberry Valley, 6000 feet, six (nos. 2091–2096); Tahquitz Valley, 8000 feet, two (nos. 2156, 2157); Round Valley, 9000 feet, two (nos. 1755, 1756); Hemet Lake, 4400 feet, two (nos. 2238, 2239); Kenworthy, 4500 feet, nine (nos. 1873–1881); Garnet Queen Mine, 6000 feet, one (no. 1997); Santa Rosa Peak, 7500 feet, three (nos. 1994–1996); Toro Peak, 8000 feet, three (nos. 1991–1993); forty-six in all. Also observed on Thomas Mountain, 6800 feet, but none collected there. One was heard calling in the brush of the foothills near Banning at the north base of the mountains, the lowest point where the species was noted.

The species was everywhere an inhabitant of the chaparral. Though common on the brush-covered hills surrounding Hemet Valley, as at Kenworthy and Hemet Lake, individuals were never seen in the clumps of timber scattered in the sagebrush of the valley just below. In Tahquitz Valley, and on some of the surrounding ridges, they frequented tracts of chinquapin and young fir trees.

Round Valley, 9000 feet, is an unusually high record station for the species, but tracts of brush such as were occupied com-

monly on Tahquitz Ridge, extend with but few breaks to the former point, in fact nearly to the summit of San Jacinto Peak, and having reached Round Valley, there seems to be little to hinder the animal from ranging over the Peak. The species was not observed at any point on the desert slopes of the mountains.

Though most of the specimens collected (taken from the middle of May to the middle of August) are in good condition, as regards pelage, there is one striking exception, an adult female (no. 1876) taken at Kenworthy, May 22. On this animal the hair is worn to such an extent that the color pattern has entirely disappeared. It looked entirely black as it darted over the rocks, and is in fact sooty over the entire upper surface of the body.

Eutamias speciosus speciosus (Allen)

San Bernardino Chipmunk

Thirty-nine specimens were procured, as follows: San Jacinto Peak at 10,000 feet, one (no. 1757); Round Valley, 9000 feet, twenty (nos. 1768–1777, 1798–1807); Tahquitz Valley, 8000 feet, eighteen (nos. 2129–2137, 2158–2166).

This chipmunk adhered closely to the Boreal zone on the main San Jacinto Mountains, not being seen below an altitude of 8000 feet. It was not found on Santa Rosa at all. The range of this mammal closely coincided with that of the chinquapin (*Castanopsis*). While not seen on the actual summit of the peak, *Eutamias speciosus* was noted commonly on chinquapin slopes up to 10,000 feet, and in all probability occurred all over the uppermost heights.

No young were seen up to July 20, but on the 23rd juvenals were taken, and soon after were plentiful. Nothing can here be added to the account of habits already given (Grinnell, 1908, p. 139).

The cursory examination given the series of specimens available shows no differences which, perhaps, might be expected to appear between the two colonies inhabiting the San Jacinto and San Bernardino mountains respectively, with the San Gorgonio Pass intervening.

Ammospermophilus leucurus leucurus (C. H. Merriam)
Antelope Chipmunk

An abundant species along the lower desert slopes of the San Jacintos. Beginning at the southeast, the species was first encountered on Piñon Flat well up into the piñon belt. It was here observed as high as Asbestos Spring, 4500 feet. From there northeast all over the Dos Palmos and Black Mountain country it was plentiful, as also down Palm Cañon from about the 3000-foot contour to its mouth. Numerous at Palm Springs, Snow Creek, and as far up San Gorgonio Pass as Cabezon, 1700 feet. Nothing was seen of this rodent at Whitewater, where *Citellus t. chlorus* was common. Apparently the antelope chipmunk does not far invade the open sandy stretches of desert, which are complementarily occupied by *C. t. chlorus*.

An interesting discovery was the existence of *A. l. leucurus* as a colony, probably now isolated, in San Jacinto Valley. Here, around Vallevista, they occupied a wash well out from the mouth of a cañon entering the valley from the east.

Specimens of this chipmunk were taken as follows: Dos Palmos and Carrizo Creek, 3000 to 3500 feet, five (nos. 1933–1937); Palm Cañon, 3000 feet, one (no. 2058); Palm Springs, 450 feet, five (nos. 6043–6045, 6393, 6757); Snow Creek, 1500 feet, five (nos. 1508–1512); Cabezon, 1700 feet, seven (nos. 1308–1314); Vallevista, 1800 feet, four (nos. 2268–2271).

The specimens from Vallevista do not present appreciable differences from those from the desert base of the mountains. Although typically a member of the arid Lower Sonoran fauna, this rodent in places ranges higher than most other Lower Sonoran forms, even well through the Upper Sonoran, as on the north side of the San Bernardino Mountains (see Grinnell, 1908, p. 141). It is not difficult, therefore, to explain its occurrence in San Jacinto Valley by one-time invasion during a period of meteorologically favorable seasons over the intervening Upper Sonoran hills from the vicinity of Cabezon.

Both at Cabezon and Vallevista this chipmunk was observed in cactus plants, eating buds or fruits. The animals appeared to be well able to move about and handle the prickly fruits without incurring injury. In one case, however, a stout thorn

was found firmly stuck in the roof of a chipmunk's mouth. In August, when the fruits were fully ripe, the purple stain was found to have discolored not only the mouths of the chipmunks, but to have permeated the whole abdominal region internally.

Citellus tereticaudus chlorus Elliot

Palm Springs Ground Squirrel

Numerous in a tract of sand dunes on the desert immediately south of the railroad station at Whitewater, 1130 feet. Here, June 3 to 5, eighteen specimens were trapped (nos. 1542–1559). Three of these are half-grown juvenals. Both young and old are distinctly grayer in color dorsally than in series of *tereticaudus* of corresponding season from the Imperial and Lower Colorado valleys, which are decidedly cinnamomeous in tone. Although we fail to detect any other differences, this peculiarity in color seems to be alone sufficient to warrant the use of the separate name, *chlorus*, of Elliot (1903, p. 242), type locality Palm Springs. The form is best regarded, in our opinion, as a subspecies of *tereticaudus*.

Citellus beecheyi fisheri (C. H. Merriam)

Fisher Ground Squirrel

Twenty-eight specimens preserved as follows: Whitewater, one (no. 1560); Cabezon, nine (nos. 1405–1413); Banning, one (no. 1417); Schain's, four (nos. 1635–1637, 2706); Thomas Mountain, one (no. 2217); Strawberry Valley, nine (nos. 2078–2086); Tahquitz Valley, two (nos. 2154, 2155); Round Valley, one (no. 1760). The ground squirrel was noted also at 8500 feet altitude near the summit of Toro Peak, about Hemet Lake and through Hemet Valley, in Deep Cañon, and around Asbestos Mountain. In Round Valley, at 9000 feet altitude, it was actually abundant, as also in Strawberry Valley. The species thus ranged from the Pacific to the desert base and from the lowest zone to the highest. It does not occur, however, to the north and east far out on the desert floor, being apparently limited in that direction to the rocky foothills. This is essentially a Pacific district species, though with remarkable ability to establish itself

under extreme arid conditions, and not only this but at an altitude of much lower temperature than in its usual zone, Upper Sonoran.

While at Cabezon half-grown young were taken on May 16, the young had but just appeared in Tahquitz Valley, July 21. The difference in zone accounts for this difference in breeding season.

We have compared our San Jacinto series with *C. b. beecheyi*, from Monterey and the vicinity of San Francisco, and with topotypes of *C. b. fisheri* from northeastern Kern County, finding the San Jacinto animal to be much nearer the latter. The features as compared with *beecheyi* of west-central California, are generally paler coloration, whiter and more extended shoulder stripes, and whiter, less buffy under surface. The latter appears to us to be the most constant and therefore reliable feature for the distinguishment of *fisheri* of southern California from *beecheyi*.

Sciuropterus alpinus californicus Rhoads

San Bernardino Flying Squirrel

Found at but one locality, Idyllwild, in Strawberry Valley, 6000 feet altitude. While camped here, July 4 to 15, we heard almost every night the chuckling of *Sciuropterus* in the black oaks and yellow pines around our beds. Number 0 steel traps and "Out-o-sight" rat traps were placed on stumps and branches around about, baited with dried prunes and fresh apricots; but these were not touched, except by jays in the daytime. On the night of July 12, four rat traps were baited with bread-butter-and-sugar and placed in crotches of black oaks about seven feet above the ground at the back of "cottage number one." Since various diurnal mammals regularly visited the garbage cans at the rear of this and other houses in Idyllwild it might be expected that nocturnal ones would also; and sure enough, the following morning our first and only flying squirrel rewarded our scheming.

The specimen (no. 2088) is an old female, at the date of capture long past breeding. Comparison with examples of *californicus* from the San Bernardino Mountains (see Grinnell,

1908, p. 138) shows not the slightest appreciable difference in colors or proportions. The San Jacinto specimen measures: length 312, tail vertebrae 146, hind foot 38. The present instance furnishes the southernmost station for any flying squirrel along the western side of North America.

Onychomys torridus torridus (Coues)

Arizona Grasshopper Mouse

Nine specimens of grasshopper mouse which we refer provisionally to this form were obtained, as follows: Snow Creek, 1500 feet, four (nos. 1570, 1571, 1573, 1574); Whitewater, 1130 feet, three (nos. 1572, 1575, 1576); Cabezon, 1700 feet, two (nos. 1264, 1266). These stations are within the Lower Sonoran zone on the desert base of the mountains, this being probably the extreme western limit of the race of Onychomys inhabiting the Colorado desert. The paleness in coloration of the above examples, both adults and young, as compared with those from San Jacinto Valley, appears to afford sufficient ground for recognizing this and the following race from the San Jacinto region as here indicated, although no other differential features are apparent. But we are considerably in doubt as to what name to employ for the representative on the desert side. It is quite probable that this is not at all typical of true *torridus;* yet we fail to find conclusive evidence to warrant us in using the name *perpallidus* of Mearns (1896, p. 140). The Museum's entire series of *Onychomys* is inadequate. Mearns himself does not appear to have had much material at his disposal, and his characterization is not convincing.

Onychomys torridus ramona Rhoads

San Bernardino Grasshopper Mouse

Four specimens secured (nos. 2251–2254), September 1 to 5, at Vallevista, in San Jacinto Valley. These are quite like examples from the vicinity of Riverside in their very dark tone of coloration and are evidently to be referred to *ramona*, thus adding another coast-belt form to the list of those occurring on the western slopes or base of the San Jacinto Mountains. One

of the above specimens is a half-grown juvenal. All were caught on the gravelly floor of the valley among scattered brush, the station being within the Lower Sonoran zone.

Peromyscus maniculatus sonoriensis (LeConte)

Sonora White-footed Mouse

A series of ninety-six specimens was preserved as follows: Round Valley, 9000 feet, three (nos. 1763–1765); Tahquitz Valley, 8000 feet, twenty-two (nos. 2168–2187, 9332, 9333); Strawberry Valley, 6000 feet, three (nos. 2075–2077); Santa Rosa Peak, at 7500 feet, three (nos. 2038–2040); Kenworthy, 4500 feet, thirty-one (nos. 1811–1817, 1828–1847, 1858, 9329–9331); Vallevista, 1800 feet, four (nos. 2255–2257, 9384); Fuller's Mill, 6000 feet, two (nos. 1649–1650); Schain's Ranch, 4900 feet, eight (nos. 1648, 1671–1677); Banning, 2300 feet, two (nos. 1463, 1464); Cabezon, 1700 feet, fifteen (nos. 1265, 1270–1283); Snow Creek at 1500 feet, one (no. 1598); Whitewater, 1130 feet, two (nos. 1577, 1599).

The species was thus captured at almost every collecting station, from the highest point at which traps were set (Round Valley, 9000 feet) to both the Pacific and desert bases of the mountains. As is notoriously the case elsewhere, this mouse ignores zone limits in its dissemination, occurring in the San Jacinto region from Lower Sonoran to Canadian, inclusive of both zones. Furthermore, it ranges indiscriminately through different associations, being caught among cactus and creasote brush on the dryest desert floor, on sage flats, in chaparral, and in veratrum patches on wet Boreal meadows.

Our large series of specimens shows such a range of apparently individual variation, both as to color and size, as to baffle our attempts at segregation on geographical grounds. A paling desertwards, as with so many of the mammals of the region, might well be expected; and there may be such, if our senses or methods were refined enough to take proper account of the variation from other than geographical causes.

Taking the whole series in mass effect, we feel justified in employing for it the one name *sonoriensis*, thus following Osgood (1909, p. 93) in the disposition of his material. Many individual

skins might upon their separate merits be referred to *gambeli*, and it is patent that the mean of the whole aggregate might fall between typical *sonoriensis* and typical *gambeli;* but we feel that the leaning of the mode is most strongly toward the former. The San Jacinto region is again shown to lie on the borderland between two faunal areas, their distinctive forms here blending or hybridizing, which, is not easy to say. Osgood (1909, pp. 68–70, 91) has admirably treated of the problem in similar situations in his revision of the genus *Peromyscus*.

Peromyscus boylei rowleyi (Allen)

Rowley White-footed Mouse

Our collection contains 131 specimens apportioned by localities as follows: Garnet Queen Mine, 6000 feet, twenty-three (2008–2028, 9334, 9335); Kenworthy, 4500 feet, five (nos. 1790–1794); Thomas Mountain, 6800 feet, twelve (nos. 2218–2228, 9337); Hemet Lake, 4300 feet, two (nos. 2242, 2243); Strawberry Valley, 6000 feet, twenty-one (nos. 2098–2117, 2128); Tahquitz Valley, 8000 feet, fourteen (nos. 2203–2215, 9336); Round Valley, 9000 feet, thirteen (nos. 1767, 1778–1789); Fuller's Mill, 5900 feet, eighteen (nos. 1717, 1728–1744); Schain's Ranch, 4900 feet, twelve (nos. 1678–1689); Cabezon, 1700 feet, four (nos. 1268, 1269, 1585, 9338); Snow Creek, 1500 feet, four (nos. 1584, 1586–1588); Dos Palmos Spring, 3500 feet, three (nos. 1910–1912).

This species would appear to be about as widely distributed through this region as *Peromyscus m. sonoriensis;* for it is recorded from fully as many stations. But *P. b. rowleyi* has much more marked associational restrictions, being very closely confined to the vicinity of water courses. Although ranging from Lower Sonoran, as at Cabezon, to the highest station in Boreal where any trapping was carried on, the low zone captures were made along streams where the contention might well be made that at least one zone higher was the one really present, although closely hemmed in on either side by the lower zone. The metropolis of *rowleyi*, judging from its distribution elsewhere in southern California as well as in the area under consideration, is

evidently the riparian association within the Transition zone. From this focus it invades both above and below along favorable routes.

At Garnet Queen Mine this mouse was found up the shaded cañon sides beneath golden oaks, as well as down along the stream. In Strawberry Valley many were caught along the alder-lined creeks, often beneath undercut banks overhung with gooseberries and tangles of roots. At still higher altitudes those caught evidently had their headquarters in the clumps of willows outlining the veratrum meadows.

The three specimens from the desert edge, at Dos Palmos Spring, were trapped along the water course marked for a short distance by a scanty seepage. A remarkable circumstance was the occurrence at this point, in fact within the course of one line of traps, of no fewer than four species of the one genus *Peromyscus*, namely, *stephensi*, *eremicus*, *martirensis*, and *rowleyi*. This situation evidently resulted from the commingling of representatives from the two faunas which abut at this point, the first two species belonging to the arid contingent.

Fully as interesting as those cases where there is a clear transition through the San Jacinto region from one subspecies to another, as in certain species of *Perognathus* and *Neotoma*, are those cases where no trace of such modification is evinced. *Peromyscus b. rowleyi* offers an instance of the latter sort, as it ranges from one extreme of geographical conditions almost to the opposite, and as far as we are able to detect there is not the slightest variation displayed other than due to age, sex, and individual peculiarity.

As a possible explanation of this indifference we may offer, that the associational predilections are in this mammal of more weight than zonal, and the association followed is nearly uniform. Further, *P. b. rowleyi* is an animal whose focus of dispersal is in a *high* zone, so that upon a mountain like San Jacinto its range fits over the topography like a mantle. It appears to be altogether those animals of Upper and Lower Sonoran, and of wide range in adjacent areas where they have separately differentiated, which exhibit geographical modification within the relatively short distance embraced in the north-and-south diam-

eter of the San Jacinto region. It is probable that in these animals the higher mountain ridge serves as a barrier. Although obviously of no great length and even not continuous, this barrier is doubtless to some degree effective in isolation.

It is the animals of the *lowest* zone which exhibit the most divergent characters at the two faunally most divergent bases of the mountain.

Peromyscus truei martirensis (Allen)

San Pedro Martir Big-eared Mouse

As indicated by our trapping, this mouse is, with the exception of *P. c. stephensi*, the least common of the genus in the area explored. But fifteen examples were secured, as follows: Santa Rosa Peak, 7500 feet, six (nos. 2029–2034); Strawberry Valley, 6000 feet, two (nos. 2127, 2138); Kenworthy, 4500 feet, five (nos. 1797, 1808–1810, 1913); Dos Palmos Spring, 3000 to 3500 feet, two (nos. 1914, 1915).

They were trapped only on dry chaparral-covered hillsides. As noted from the localities of capture there is considerable zonal range, Dos Palmos Spring being well down into the area of blending of Upper with Lower Sonoran, while the stations on Santa Rosa Peak and in Strawberry Valley were in areas of mingling of Upper Sonoran and Transition elements. It would appear that Upper Sonoran chaparral of the Pacific slope is the locally preferred habitat of this mouse.

We follow Osgood (1909, p. 171) in the name assigned to this mouse. The series is pale-colored as compared with representatives of *truei* from Mount Pinos, Ventura County. The latter are evidently somewhat intermediate towards *P. t. gilberti*. Our examples, however, have not nearly so long tails as the measurements given for topotypes of *martirensis*. Thirteen adults give a tail length of 102.5 (83–111) as contrasted with "116.5 (112–122)." It is evident that the San Jacinto animals average somewhere between typical *truei* and *martirensis* in sum total of characters, though not deserving of separate recognition in nomenclature.

Peromyscus crinitus stephensi Mearns

Stephens Cañon Mouse

Detected at but one station, Dos Palmos Spring, 3500 feet, where two adults (nos. 1908, 1909) were trapped June 1, along the steep rocky wall of the ravine just below the two palms from which the place receives its name. These specimens are quite indistinguishable from the Museum series of the species from Victorville on the Mojave Desert and from the California side of the Colorado River.

Peromyscus californicus insignis Rhoads

Southern Parasitic Mouse

Thirty-five specimens obtained, as follows: Tahquitz Valley, 8000 feet, one (no. 2198); Kenworthy, 4500 feet, two (nos. 1795, 1796); Schain's Ranch, 4900 feet, fifteen (nos. 1690–1697, 1708–1714); Banning, 2200 feet, three (nos. 1414–1416); Cabezon, 1700 feet, thirteen (nos. 1267, 1323–1332, 1581, 1582); Snow Creek, 1500 feet, one (no. 1583).

The distribution of this mouse is typically Upper Sonoran, coinciding with the chaparral belt of that zone. The single example from Tahquitz Valley was far up in Transition, though in actual distance the interval to be traversed in reaching the place was not great; a belt of cherry and manzanita brush was continuous down the slope to the east. Of casual interest is the fact that not one example of this mouse was taken as a result of all our trapping in Tahquitz Valley; the specimen obtained was found drowned in a pitcher of milk at the summer camp in the valley.

The occurrence of the species so far down zonally as Cabezon and Snow Creek is noteworthy, for especially the latter point is well into Lower Sonoran. As far as we are able to discern the series from the desert slope differ in no way from those from the Pacific slope, and these in turn are identical with topotypes of *insignis* from Dulzura, San Diego County.

Peromyscus eremicus eremicus (Baird)

Desert White-footed Mouse

The seventy-five specimens collected represent localities as follows: Banning, 2300 feet, eight (nos. 1449–1456); Cabezon, twenty (nos. 1284–1300, 9339–9341); Snow Creek at 1500 feet, eight (nos. 1563–1567, 1578–1580); Palm Springs, 450 feet, three (nos. 5983, 5984, 6803); Palm Cañon, at various altitudes, ten (nos. 2068–2074, 9342–9344); vicinity of Dos Palmos Spring, 3000–3500 feet, twenty-six (nos. 1940–1947, 1958–1967, 1998–2005).

It is observable that all of these localities are on the desert side of the mountains, and all are either well within the Lower Sonoran zone, or at highest (Banning) in the belt of blending of that zone with the next higher. Thus, within the same genus, we find a species (*sonoriensis*) apparently oblivious of temperature range, while the present, *eremicus*, is closely limited to the climatic conditions obtaining in one division of one zone.

The desert white-footed mouse appears to affect by preference sandy ground rather sparsely provided with clumpy xerophytic shrubs.

Our series of specimens is very uniform in the main observable characters, save as obviously due to age. The specimens from Banning are a trifle the darkest, a possible tendency towards *P. e. fraterculus*, the Pacific Coast race of the species. The latter, however, we failed to find in San Jacinto Valley, though we had anticipated its occurrence there. The series as a whole closely resembles material from the lower Colorado Valley. In mass effect the latter are faintly paler-colored.

Reithrodontomys megalotis longicauda (Baird)

Long-tailed Harvest Mouse

Localities of capture were: Banning, 2200 feet, five (nos. 1457–1461); Cabezon, 1700 feet, five (nos. 1301–1305); Snow Creek, 1500 feet, one (no. 1569); Sehain's Ranch, 4900 feet, three (nos. 1632–1634); Strawberry Valley, 6000 feet, one (no. 2097); Hemet Lake, 4400 feet, three (nos. 2244, 2245, 9345). The last

three stations were the highest at which the species was found to occur, these being barely within the limits of Lower Transition. The species here as elsewhere seems to be essentially Sonoran, and affects grassy places of not too moist a character.

Examination discloses no obvious differences between specimens from the San Gorgonio Pass base of the mountains and the few from the Pacific side. There is some variation, and, as in series from elsewhere in southern California, certain examples appear to be more reddish on the rump than any from the San Francisco Bay region. The general tone of coloration, however, is not decisively paler than in the northern animals; and the San Jacinto series, as far as it goes, is satisfactorily referable to *R. m. longicauda*.

Neotoma intermedia intermedia Rhoads

Dulzura White-footed Wood Rat

Neotoma intermedia gilva Rhoads

Banning White-footed Wood Rat

Neotoma intermedia desertorum C. H. Merriam

Desert Wood Rat

One hundred and two specimens of wood rats of the *intermedia-desertorum* category are in our collections from the San Jacinto region. In spite of the fact that the genus *Neotoma* has been but recently monographed (Goldman, 1910), this portion of our material has given us much trouble in its determination. In Goldman's paper referred to, *intermedia* (with its subspecies *gilva*) and *desertorum* are treated not only as distinct forms, but as species belonging to two "groups"—and not nearly related ones—of the subgenus *Neotoma* within which the author recognizes six such subdivisions. This is a departure from the early views of C. H. Merriam (1894, pp. 117–120), who recognizes but four groups, in one of which, "the *desertorum* group," he includes both *intermedia* and *desertorum*. The results of our study prove to be most in accord with the latter view, and even suggest strongly the propriety of considering *desertorum* as but a subspecies of *intermedia*.

Our material from the limited region under consideration hails from the following localities: Garnet Queen Mine, 6000 feet, two specimens (nos. 2056, 2057); Kenworthy, 4500 feet, three (nos. 1868, 1871, 1872); Vallevista, 1800 feet, thirteen (nos. 2289–2301); Banning, 2200 feet, twenty-five (nos. 1424–1448); Cabezon, 1700 feet, twenty-three (nos. 1333–1338, 1341, 1343–1354, 1524, 9346–9348); Snow Creek at 1500 feet, thirteen (nos. 1513–1517, 1525–1532); Whitewater, 1130 feet, nine (nos. 1518–1523, 1533–1535); Palm Springs, 450 feet, one (no. 6969); Palm Cañon at 800 feet, two (nos. 2066, 2067; Palm Cañon at 2500 feet, one (no. 2065); Dos Palmos Spring, 3500 feet, ten (nos. 1948–1957).

The first three localities are on the Pacific side of the mountains. The specimens from Garnet Queen Mine were trapped around a loose rock wall serving to retain a roadway on an Upper Sonoran chaparral hillside. Those at Kenworthy, also in Upper Sonoran, were taken near crevices in huge boulders surrounded by chaparral. In the vicinity of Vallevista the animals were taken along banks of washes, where they lived in holes in the ground, with no vestiges of houses.

The remainder of the localities of capture are all on the desert slope of the mountains. The series from Banning, Cabezon, and Snow Creek were trapped along the foothills forming the southern margin of San Gorgonio Pass. Those at Whitewater and Palm Springs were on the floor of the desert about patches of cactus and creasote bushes. Around Dos Palmos Spring the animals were inhabiting rock piles almost exclusively; there were no stick houses, only occasional scant accumulations of the shriveled remains of cactus fruits. Zonally, the Banning station is at the lower edge of Upper Sonoran, while all the other desert slope stations are in Lower Sonoran, Palm Springs, and Whitewater being far down in that zone.

In studying our series of white-footed wood rats we have reviewed appurtenant literature for the purpose of finding out what characters have been thought to be of service in distinguishing *intermedia*, *gilva*, and *desertorum*. The features so employed are: General coloration, quality of pelage, general size, relative size of ears, relative length of tail, general size and angularity

of cranium, shape of interparietal, width of interorbital constriction, development of supra-orbital "bead," shape of nasals, relative size of audital bullae, and outline of palate posteriorly.

First, as leading to clearness in the discussion to follow, we herewith present a comparative diagnosis of *intermedia* and *desertorum*, the former based upon a series from the vicinity of San Diego, the latter upon a series from along the Colorado River between Needles and Yuma.

Double-column Diagnosis of Neotoma i. intermedia versus N. i. desertorum

Neotoma i. intermedia	*Neotoma i. desertorum*
General coloration above dark: blackish mid-dorsally, mixed with clay color, this most pure along the sides and about the face; beneath white, with much deep plumbeous at bases of hairs throughout (occasional examples with hairs on small pectoral patch white to base); ankles dusky; tail black above.	General coloration above pale: sepia mid-dorsally, mixed with pinkish buff, this color clearest anteriorly and along sides; beneath white, with slight amount of pale plumbeous at bases of hairs except on pectoral region and narrow line mid-ventrally which are pure white; ankles white; tail grayish brown above (variable to blackish).
Pelage harsh: hairs relatively stiff and coarse.	Pelage soft: hairs relatively fine and silky.
Size large: average 13 males, length 336, tail vertebrae 159, hind foot 34.3, ear 30.4. (For females and range of variation see figs. A–C).	Size small: average 10 males, length 288, tail vertebrae 134, hind foot 30.8, ear 28.5. (For females and range in variation see figs. A–C).
Tail "long": ratio of tail to body in 13 males, 89%.	Tail "short": ratio of tail to body in 10 males, 87%.
Skull large throughout, this involving all features, save that rostrum and nasals are relatively longer and narrower, while audital bullae are actually as well as relatively less inflated.	Skull small throughout, this involving all features, save that rostrum and nasals are relatively shorter and hence blunter, while the audital bullae are distinctly larger, more inflated.

Length of ear is not included in above tabulation, because found by us to be of inappreciable difference in size proportionally. It will be noted that the emphasized character of relative tail length is really very small!

We have tested the matters of angularity of skull, shape of interparietal, width of interorbital constriction, development of supraorbital bead, and outline of palate posteriorly, and find all these features subject to much variation. Of course age has been taken into account in our examination, as indicated by degree of emergence and wear of the molar teeth. As far as our studies have gone none of the features just mentioned affords a character of tangible worth in distinguishing *intermedia* from *desertorum*. The general large size of *intermedia* covers much of the alleged difference in minor features.

According to Goldman in his revision (1910, p. 45) *N. i. gilva* is identical with *intermedia* in cranial characters and general size, differing only in paler, more yellowish, coloration. It is further stated (Goldman, 1910, p. 76) that "in general appearance" *desertorum* "closely" resembles *gilva*.

The above preliminary outline of the elements to be considered brings us to the critical treatment of our series of white-footed wood rats from the San Jacinto area. At the outset we are confronted by a baffling lack of uniformity exhibited throughout the material. Characters of *N. i. intermedia*, *N. i. gilva* and *N. i. desertorum* are varyingly presented. The situation is therefore best met by dealing with each locality separately.

Of the two specimens from Garnet Queen Mine, one is young, the other an old adult male. The latter measures small for *intermedia;* its skull is small with relatively blunt rostrum, like *desertorum*, but the audital bullae are small as in *intermedia*. In color both specimens are paler than *intermedia* and identical with examples from Banning, the type locality of *gilva*.

The three specimens from Kenworthy, two old adults and one young one, are in their dark colors throughout good *intermedia* But they are, again, rather small: male, 320 x 152 x 33; female, 295 x 130 x 32. [To appreciate size values, the appended charts, figs. A–C, should be consulted.] Cranially these examples are slightly smaller than average *intermedia*, but otherwise identical with this form, topotypes of which are at hand from Dulzura.

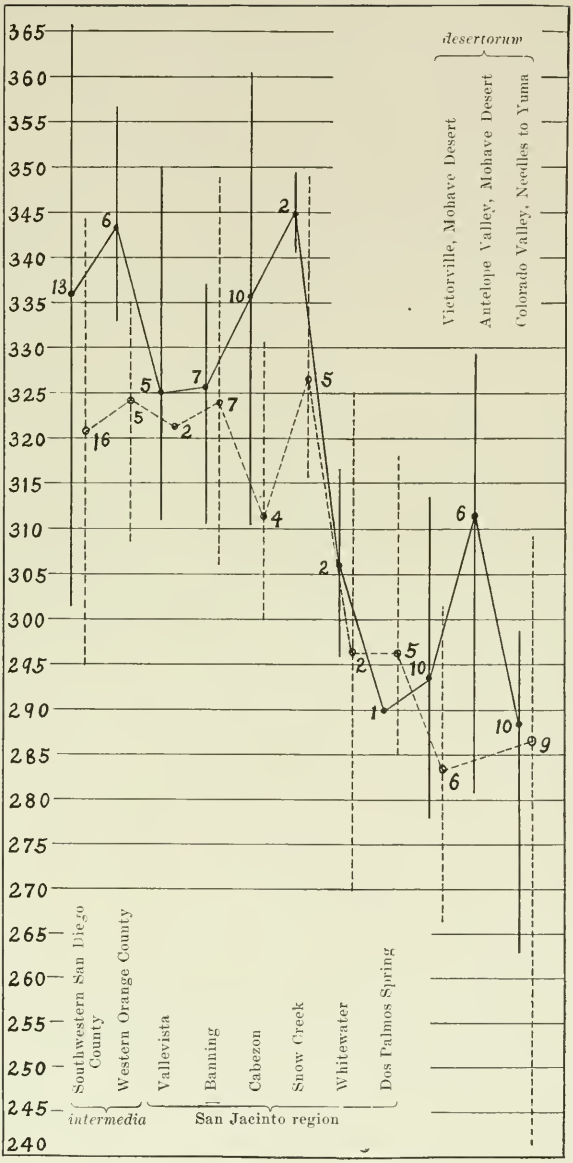
The Vallevista series of thirteen are cranially *intermedia;* in coloration they are pale like the Banning series, save that one example (no. 2293) is paler still, practically the same shade as

in *desertorum*. The pelage of this example is slightly harsher, however, and the skull is as in *intermedia*. These Vallevista wood rats average smaller than *intermedia* proper, in this respect again resembling the topotypes of *gilva*.

The name *gilva* was applied (Rhoads, 1894, p. 70) to a white-footed wood rat from Banning. Our series of twenty-five from that locality are thus topotypes. They bear out the single assigned character of *gilva* (as compared with *intermedia*), namely, general paleness of coloration. They show in addition an average smaller size than San Diego County *intermedia*, a slight resemblance to *desertorum*. An analysis of the color characters shows also in all respects an approach to *desertorum*: As compared with *intermedia* there is less of the black admixture mid-dorsally; the brown tones are paler, more buffy; ventrally the white is more extensive, in other words, the plumbeous occupies a less space on the individual hairs, and there is more frequently a pure white pectoral patch; the upper side of the tail is less black, more brownish. Contrary to Goldman's statement (1910, p. 45) that cranially *gilva* is like *intermedia*, we find that Banning old adults have visibly smaller and lighter skulls than *intermedia* from the vicinity of San Diego, and the rostrum and nasals are shorter. Thus far the resemblance is towards *desertorum*, but the audital bullae are notably smaller than in that form, and no larger than in *intermedia*.

Cabezon, farther down the San Gorgonio Pass towards the desert proper, furnishes twenty-three examples for our study. These are apparently identical in color with the Banning series, and hence the same general remarks apply. Cranially, too, the two series are practically alike. In measurements, the Cabezon males are larger, and the females are smaller, respectively, than in the Banning animals. These differences are likely therefore to

Fig. A (on opposite page). Diagram showing individual and geographic variation in total length (in millimeters) of certain adult white-footed wood rats. Solid lines, males; broken lines, females; figures at left and right of these lines, respectively, indicate numbers of individuals measured; length of lines shows range of individual variation; points connected by solid and broken lines, respectively, mark positions of averages. Note general reduction in the dimension geographically from the San Diegan district (at left) through the San Jacinto region to the desert.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desertorum
Victorville, Mohave Desert
Antelope Valley, Mohave Desert
Colorado Valley, Needles to Yuma
Southwestern San Diego County
Western Orange County
Vallevista
Banning
Cabezon
Snow Creek
Whitewater
Dos Palmos Spring
intermedia
San Jacinto region

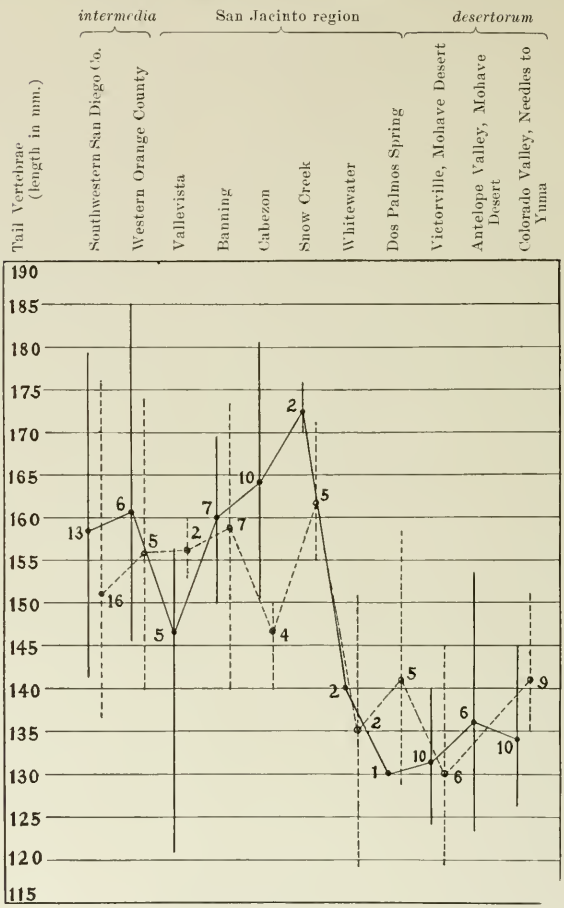

Fig. B. Diagram showing individual and geographic variation in length of tail of certain adult white-footed wood rats. Solid lines, males; broken lines, females; figures at left and right of these lines, respectively, indicate numbers of individuals measured; length of lines shows range of individual variation; points connected by solid and broken lines, respectively, mark positions of averages. Again note general reduction in the dimension geographically from the San Diegan district (at left) through the San Jacinto region to the desert.

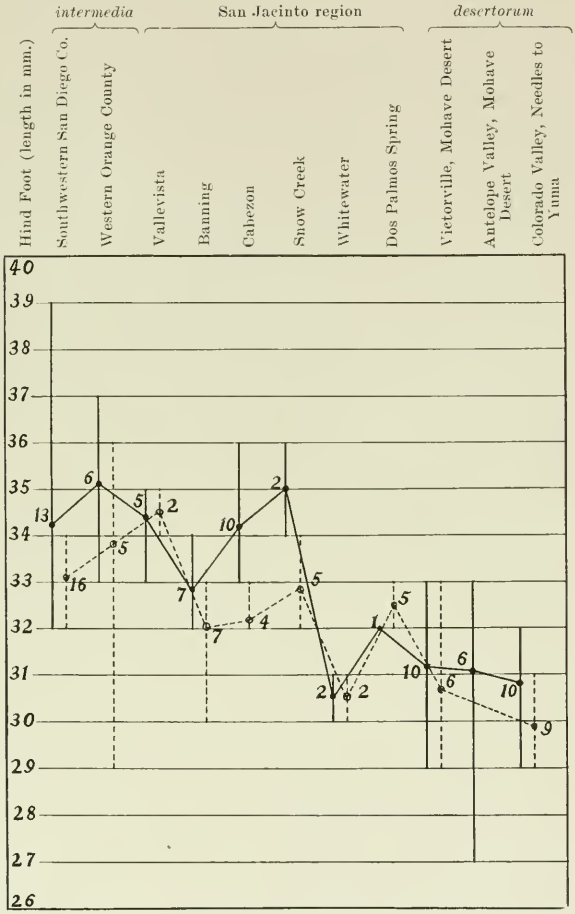

Fig. C. Diagram showing individual and geographic variation in length of hind foot of certain adult white-footed wood rats. Solid lines, males; broken lines, females; figures at left and right of these lines, respectively, indicate numbers of individuals measured; length of lines shows range of individual variation; points connected by solid and broken lines, respectively, mark positions of averages. Again note general reduction in the dimension geographically from the San Diegan district (at left) through the San Jacinto region to the desert.

accrue from the smallness of the series involved, rather than to be of any deeper significance.

From Snow Creek, up in the foothills three miles southwest of Whitewater, there are thirteen specimens, including adults and young. These are distinctly paler than the average of the Cabezon and Banning series. All, in fact, are to be matched from *desertorum* in seasonally comparable pelage. In amount of black dorsally and white ventrally, tint of yellowish brown laterally, and dorsal color of tail, we are unable to distinguish them from *desertorum*. Also is this true in quality of pelage, though the series is in worn breeding stage, and hence not so soft as *desertorum* is in fresh fall pelage. In size some Snow Creek examples are well toward the upper limit of the range of variation in *intermedia*: the series averages large. Cranially old adult males are still large, like the ones from Cabezon and Banning, though not so large and long-snouted as *intermedia* proper. The audital bullae remain small, but with evident variation.

From Whitewater station, on the floor of the desert sloping up toward San Gorgonio Pass, and only three miles from the station at Snow Creek, there are nine, mostly young. These all show the small size, pale coloration, and soft pelage of typical *desertorum*. [See charts showing variation in measurements, figs. A–C, which take account only of adults.] Cranially we can see no difference from *desertorum*, except in audital bullae, which are appreciably smaller. This difference, however, vanishes when selected examples of *desertorum* are lined up with the Whitewater crania in proper sequence; in other words, while there is average difference in this respect, individual variation (or the results of interbreeding) bring an overlapping or intergradation. From *intermedia* and *gilva* from Banning, the Whitewater crania are markedly distinguished by lesser bulk and shortness of rostra and nasals.

Unfortunately we have from Palm Springs, well out on the floor of the desert, but one example. This in all respects, including audital bullae, is quite typical of *desertorum*. It is noteworthy that an obvious intergrade between *desertorum* and *intermedia* has been described from Palm Springs. This is "*Neotoma*

bella" (Bangs, 1899, pp. 66, 67). Judging from those of the ascribed characters which are at all pertinent, the type specimen was nearest *desertorum*. Moreover, Goldman (1910, p. 78) synonymizes the name *bella* under *desertorum*.

The thirteen specimens from Palm Cañon are small, like *desertorum*, with small skulls just like the Whitewater ones, but are rather coarser pelaged and are dark, being almost facsimiles of Banning and Cabezon examples of corresponding age.

The series of ten adults and young from the vicinity of Dos Palmos Spring are indistinguishable in respect to size, quality of pelage, and coloration, from *desertorum*. Cranially they are also duplicates save in one respect, that of audital bullae, which are plainly less inflated.

It is shown by the foregoing array of facts that, in the white-footed wood rats of the San Jacinto area, there are two diverse types on the remoter parts of the opposite sides of the mountains, namely, *intermedia* on the Pacific side, most typically represented by the specimens from Kenworthy, and *desertorum* at the desert base, as illustrated at Whitewater, Palm Springs, and perhaps Dos Palmos. The point of emphasis is that our material, as interpreted by us, would seem to establish complete intergradation between the extreme types named. In all respects as enumerated, we find transition through various intermediate degrees of difference from one extreme to the other. This is not in accordance with currently accepted notions as regards the relationship between *intermedia* and *desertorum* (see Goldman, 1910); but were we without recourse to previous literature, we should unhesitatingly place one form as a geographic race of the other without considering any explanation of our position as called for.

That extensive intergradation between the above-named forms in the San Jacinto region is a fact, we are confident. The only argument in rebuttal of the subspecific idea is that our intermediates are in the nature of hybrids. This contention would find evidence for support in the narrowness of the area occupied by wood rats showing intermediate characters between *intermedia* and *desertorum*, and in the manifest lack of uniformity of variation from place to place.

But we would here express our grave doubts as to there being any intrinsic difference between the results of long-continued hybridization, and "intergradation."

As illustration of the unevenness in variation from place to place, to be fair, we would instance that different localities produced wood rats of such combinations of characters as: (1) small size, dark coloration and short rostrum; (2) large size, pale coloration and long rostrum; (3) pale coloration, short rostrum and small bullae; (4) pale coloration, long rostrum and small bullae; etc.

All sorts of *degrees* of characters in combination are presented, that is, as limited only by the extent of our material, so that the above array of combinations is the result only of judicious selection on our part. In no instance were both typical *intermedia* and *desertorum* found in the same locality with examples of intermediate nature. Again, it is to be observed that both on the Pacific slope of southern California, and on the desert, *intermedia* and *desertorum* occupy almost identically the same ecologic niche, with resulting similarity in habits.

The above facts might be interpreted into some form of Mendelian behavior. At any rate they appear to support the theory of hybridization, though the process, of whatever nature, has obviously proceeded so far that the real history is not subject to solution with the data at hand. The possibility of "direct action of environment" in the area of intermediate conditions between the desert and Pacific districts also enters the problem. As previously implied our data furnishes no criterion by which to distinguish here between the results of "geographic intergradation" and of hybridization.

All the facts herein set forth point, by our interpretation, to the probability that *intermedia* is a Pacific slope race of the species represented also by *desertorum* of the arid interior, and that through the major portion of the San Jacinto region we find geographic intergradation comparable to the condition in certain species of *Perognathus, Peromyscus, Dipodomys,* and *Onychomys*, as elsewhere treated in the present paper.

The fact that in the white-footed wood rats the opposite extremes are much more diverse than in the cases of the rodents

just named, probably accounts for the greater conspicuousness of the irregularities in intergradation. These peculiarities thus involve less amounts of difference in characters in the rodents named, so that "uniformity" in blending may be more apparent in them than in the wood rats. The narrowness of the area of intermediate climatic conditions appears to us also to contribute to the causes of the lack of smoothness in the intergradation of the wood rats.

At any rate, systematically the proper thing is to employ the trinomial with the wood rats as well as with the rest, and since the name *intermedia* was first proposed in this group, it takes precedence in specific combination, as presented in the heading of this article.

As to the proper name to use for the majority of the San Jacinto specimens, namely, those of intermediate nature, difficulty of determination is obvious. Feeling compelled to give some name to every specimen, we prefer to lump most of the intermediates under the name *gilva*, which was originally applied to some sort of intermediate. Thus the Kenworthy specimens alone merit the name *intermedia*, while the ones from Palm Springs, Whitewater, and Dos Palmos may be with reason included under the name *desertorum*, all other locality series bearing the name *gilva*.

Neotoma fuscipes mohavensis Elliot

Mohave Brown-footed Wood Rat

An abundant inhabitant of the Upper Sonoran chaparral belt chiefly on the Pacific drainage. Our collections contain fifty-one specimens representing the following stations: Garnet Queen Mine, 6000 feet, eleven specimens (nos. 2035–2037, 2048–2055); Kenworthy, 4500 feet, ten (nos. 1851–1857, 1868–1870); Thomas Mountain, 6800 feet, one (no. 2230); Strawberry Valley, 6000 feet, five (nos. 2122–2126); Schain's, 4900 feet, twenty (nos. 1698–1707, 1718, 1727); Cabezon, 1700 feet, four (nos. 1339, 1340, 1342, 1355).

In Strawberry Valley and on Thomas Mountain, this wood rat was fairly numerous, and was associated with some Transition zone elements as well as with other Upper Sonoran forms.

At Cabezon, the few animals captured were found in a belt of mingling of Upper and Lower Sonoran forms. The zonal position, Upper Sonoran, is indicated by these extremes.

At all points where the species was found, the characteristic stick houses were more or less in evidence. They were built up to especially large size beneath scrubby golden oaks close around the Garnet Queen Mine. At Vandeventer Flat very large nests occupied positions high in the live oaks.

The series of fifty-one specimens of this wood rat, as compared with satisfactory material from the vicinity of San Diego, shows distinctly paler coloration, sufficiently different in degree to warrant the use of a separate name.

Our four specimens from Cabezon, the only ones from the desert slopes, are no paler than the Kenworthy and Garnet Queen Mine series. Some examples from each locality show nearly pure white feet and more distinctly bicolored tail than in average *macrotis*. Since the name *macrotis* should be restricted to the dark coast form, it appears necessary to use the name *mohavensis* for the pale brown-footed wood rats of the whole San Jacinto area, just as has been done with the specimens from the San Bernardino Mountains (see Grinnell, 1908, p. 147). This seems a better course than to include the San Jacinto series under the name *macrotis*, as done by Goldman (1910, p. 94).

Microtus californicus californicus (Peale)

California Meadow Mouse

Found in small numbers in widely scattered localities, suitable ground for this rodent being limited in this region. Two adults (nos. 2240, 2241) were trapped on grassy banks close to Hemet Lake, 4400 feet, August 7 and 10. Four adults (nos. 2199–2202) were taken in the veratrum patches in meadows in Tahquitz Valley, 8000 feet, July 24, 28 and 29. An immature (no. 1766) was secured at the meadow in Round Valley, 9000 feet, July 10. An adult (no. 2007), was taken at the edge of the little stream at Garnet Queen Mine, June 27. At the latter place faint runways were observable in the low vegetation close to the stream.

We had anticipated finding *Microtus mordax*, or some related form, at least, at the upper elevations; but all the *Microtus* secured, as above specified, are unequivocally referable to the *californicus* group. In the San Bernardino Mountains, a representative of the *mordax* group is present in the Boreal zone, and *californicus*, also, is present but occupies a lower belt (up to 7500 feet altitude), the ranges of the two overlapping at several points (see Grinnell, 1908, p. 148). In the San Jacinto Mountains, *mordax* appears to be absent altogether, while *californicus* ranges up well into Boreal. This bespeaks a notable hardihood on the part of this latter species, greater than is suggested by its lower range elsewhere. It is possible that the existence of another Microtine representative in the Boreal zone elsewhere is the chief factor preventing invasion of *californicus* upward.

The San Jacinto skins of *californicus*, like those from elsewhere in extreme southern California, show a distinct mixture of reddish hairs in the dorsal pelage, giving a rusty effect as compared with *californicus* from the central portion of the state. This tendency is apparently in the direction of the character ascribed to Elliot's *Microtus c. hypcrythrus*, described from northern Lower California. The peculiarity does not seem to be developed in the San Jacinto animals to a degree to merit taxonomic recognition.

Thomomys perpallidus C. H. Merriam

Palm Springs Gopher

Palm Springs, the type locality of this gopher, was visited in February, 1912, for the special purpose of obtaining an adequate series. Forty specimens were secured, nos. 16485–16524. Two other examples are in the Museum (nos. 4635, 4672), taken in the same locality in December, 1903.

The gophers were trapped only along the ditch leading down from Tahquitz Cañon to the village, and in irrigated pastures and gardens in the town itself. The animals were actively throwing up earth only where the ground was moist. In both situations there was plenty of newly growing vegetation, particularly Bermuda grass, the root-stalks of which seem to be especially sought for food. Old workings were observed on

fine-grained sandy ground away from cultivation, on the desert floor close to the base of the foothills, and up in the mouths of cañons. Fresh mounds are rarely distinguishable on the dry desert, and it is difficult to find the open burrows in the loose dry earth of the desert. No unmistakable signs of gophers were noted at all, far out on the desert floor away from the base of the mountains.

February 9 to 12 was evidently about the beginning of the breeding season. The testes of the males were enormously developed. Three females were taken containing small embryos, four, four, and three, respectively. All the rest of the females had not yet bred, save one, which had a litter of half-grown young, one of which was captured on the 11th. In no case were males and females captured in the same burrow. Each burrow appeared to be occupied by but one individual, save in the case where there were young. Out of the forty-two gophers, fourteen, or just one-third, were males. Two to one is the proportion of females to males in at least one other species of the genus (see Grinnell, 1908, p. 151). The dimensions of the comparable males have been given in another connection (Grinnell, 1912a, p. 176).

In our 1908 explorations, gopher workings were seen in the Piñon Flat and Deep Cañon country, but we failed to secure specimens, and their identity remains conjectural. *Thomomys perpallidus*, as recently restricted (Grinnell, 1912a, p. 171), is still a well-marked form; but as far as material at command goes, it is found only in the immediate vicinity of Palm Springs.

Thomomys cabezonae C. H. Merriam

Cabezon Gopher

Twenty-four of the gophers taken are referred by us to this species. Sixteen of these (nos. 1248–1263) were obtained at the north base of the mountains in San Gorgonio Pass, 1700 feet altitude, and close to Cabezon, the type locality of *cabezonae*, and are therefore topotypes. Two others are from Snow Creek (nos. 1561–1562) at 1500 feet, six miles to the eastward. Five are from Schain's Ranch, 4900 feet (nos. 1624, 1626, 1638–1640),

the same distance due south up over the northwestern spur from the peak. And one (no. 2288) is from Vallevista, 1800 feet, down at the south base of this spur. It would appear that the species occupies the arid Upper Sonoran zone on the San Gorgonio and San Jacinto Valley sides of the mountains, possibly invading down into Lower Sonoran locally, but not as far down into that zone farther east, as at Palm Springs, where a totally different species occurs, *Thomomys perpallidus*.

The specimens of *Thomomys cabezonae* from Snow Creek and Schain's Ranch differ in no important particular from topotypes of the species. But the lone example from Vallevista, a male, young adult, is very slightly more reddish in color. Otherwise, however, it departs towards no other species. Examination of the map, and consideration of the uninterrupted and almost uniform conditions extending over the hills between Cabezon and San Jacinto, makes the continuity in range of this species between the localities represented quite probable.

In addition to the above, there are at hand three gophers (nos. 16393–16395) taken at Whitewater Ranch, which lies a mile or so north of Whitewater Station. They were obtained by Mr. H. E. Wilder, December 17, 1911, and presented by him to the Museum. These are closely similar to topotypic *cabezonae*, and indicate the occurrence of this form along the northern wall of San Gorgonio Pass, possibly invading the southern foothill region of the San Bernardino Mountains, as it does the northern foothills of the San Jacintos.

The query arises as to the relationships of *cabezonae* with the other species of gophers of the general region. Our material has been gone over with this point particularly in view, without our ascertaining anything definitely. This failure is due chiefly to lack of appropriate material from a critical series of localities.

In a very general way the material at hand seems to indicate that *cabezonae* is more nearly related to *nigricans* than to either *perpallidus* or *perpes*. It is thus possible that *cabezonae* will turn out to be a pallid, and otherwise distinguished, desert race of *nigricans*, with very much the same relative ranges and characters as *Perognathus f. pallidus* and *P. f. fallax*, and also certain other rodents.

Our ascription of the two forms of gophers to Schain's Ranch is, of course, not in harmony with this view; but our decision may well have been due to incorrect determination of the specimens concerned, which are immature; geographic intergradation between *cabezonae* and *nigricans* is not beyond possibility.

Thomomys nigricans Rhoads

Tawny Gopher

Twenty-four of the gophers taken in the San Jacinto region have, after close comparison, been referred to this form. The localities represented are Schain's Ranch, 4900 feet, four (nos. 1625, 1627, 1641, 1642); Fuller's Mill, 5900 feet, one (no. 1715); Strawberry Valley, 6000 feet, ten (nos. 2139–2148); Hemet Lake, 4400 feet, five (nos. 2233–2237); Thomas Mountain, 6800 feet, one (no. 2232); Kenworthy, 4500 feet, two (nos. 1862, 1863); and Santa Rosa Peak, 7500 feet, one (no. 1990). It will be noted that these localities lie within a vertical range of 3100 feet (4400 to 7500 feet), also that the life zone is in each case high Upper Sonoran or Transition, or better expressed, the belt of blending of these two zones. The metropolis of *Thomomys nigricans*, judging from the results of extensive field work in southern California, as represented by large suites of specimens in the Museum, is a corresponding zonal belt lying along the western slopes of the mountains of San Diego County. It is to be inferred that the range of *nigricans* here finds its northwestern limit. The San Jacinto *nigricans* are all from the Pacific slope, as are also the San Diego County series. Since specimens were taken at Schain's, where were also secured examples referred to *cabezonae*, it appears that the ranges of the two forms may overlap at least at this point. This was the only place where we found any evidence of the overlapping of the ranges of any two species of gophers, though this state of affairs is to be expected along the lines where distinct species meet. The only alternative is blending of forms through hybridization. This could be proved by the collection of gophers in a practically continuous line from one habitat into another up different sides of the mountain.

The Strawberry Valley and Hemet Lake series are to all appearances identical in color and size with topotypes of *nigricans*. Unfortunately our series does not include old males. In the females, however, the skulls are distinctly lighter, with narrower brain-case, and less squarish zygomae than in topotypes of *nigricans*. The example from Thomas Mountain is unequivocally *nigricans* like those from Hemet Lake. The two Kenworthy gophers are very young. The only specimen from Santa Rosa Mountain, is a male, young adult, satisfactorily referred to *nigricans* from both cranial and external characters. The Fuller's Mill specimen is a male, young adult; in color it strongly resembles *altivallis*, but its skull is altogether too light for that species, and together with general measurements, coincides with *nigricans*. It is to be borne in mind, too, that the color differences between *nigricans* and *altivallis* are slight. The same remarks apply to the four examples from Schain's Ranch.

The conspicuous features of *nigricans*, as represented in the San Jacinto region, are very small size (see tables), very dark reddish brown colors, and light skulls with small audital bullae.

We cannot see the logic in calling *nigricans* a subspecies of *fulvus*, as it has heretofore been considered, even granting the close similarity; for, in addition to the fact that a broad area inhabited by unrelated forms intervenes between the ranges of the two, there is the further circumstance that *nigricans* and *fulvus* occupy different life zones. These geographic considerations should be given weight in settling the status of forms. There is no continuity of range, and no intergradation possible.

All through the region including the specified localities of capture, signs of gophers were plentiful. The evident inactivity of adults after the breeding season probably accounts for our failure to secure good old examples.

List and Measurements in millimeters of full-grown females of *Thomomys nigricans*

Mus. No.	Sex	Locality	Total Length	Tail Vertebrae	Hind Foot
2233	♀	Hemet Lake, San Jacinto Mts.	202	71	28
2234	♀	Hemet Lake, San Jacinto Mts.	185	63	25
2235	♀	Hemet Lake, San Jacinto Mts.	206	59	27
2236	♀	Hemet Lake, San Jacinto Mts.	191	62	27
2237	♀	Hemet Lake, San Jacinto Mts.	197	55	28
2139	♀	Strawberry Valley, San Jacinto Mts.	195	63	26
2140	♀	Strawberry Valley, San Jacinto Mts.	200	70	28
2141	♀	Strawberry Valley, San Jacinto Mts.	202	58	27
2143	♀	Strawberry Valley, San Jacinto Mts.	187	66	26
2146	♀	Strawberry Valley, San Jacinto Mts.	191	68	27
2147	♀	Strawberry Valley, San Jacinto Mts.	207	68	28
2232	♀	Thomas Mt., San Jacinto Mts.	200	62	26
1625	♀	Schain's Ranch, San Jacinto Mts.	215	68	29
1627	♀	Schain's Ranch, San Jacinto Mts.	206	64	28
1642	♀	Schain's Ranch, San Jacinto Mts.	194	62	29
		Average of the 15 ♀♀	198	64	27

Thomomys altivallis Rhoads

San Bernardino Mountain Gopher

The twelve specimens of gophers referred by us to this species were obtained at but two localities: Tahquitz Valley, 8000 feet, ten (nos. 2188–2197), and Round Valley, 9000 feet, two (nos. 1761, 1762). The latter is well within the Boreal zone and the former is at least high Transition. As no other gopher was obtained above low Transition, it is evident that *altivallis* is the Boreal representative of the genus on this mountain as it is on the San Bernardino range (see Grinnell, 1908, p. 150). Not one old male was secured on San Jacinto; but five females, as shown in the accompanying table, measure close to the average of San Bernardino Mountain females. In coloration both adults and young are identical with corresponding pelages in the San Bernardino series, save that there is more or less white on the throat and belly of several of the San Jacinto skins.

If our identification proves correct, *Thomomys altivallis* so far as now known exists only on the San Bernardino and San Jacinto mountains, with the deep San Gorgonio Pass separating these two colonies. Small differences may yet be found as a

result of this isolation. The nearest relative of *altivallis* appears to be *Thomomys alpinus* of the Mount Whitney region, also a boreal species. The chief appreciable differences between the two lie in the somewhat smaller size of *alpinus*, and in its slightly grayer general coloration and constantly white throat. The latter peculiarity is possessed by some examples of *altivallis* from the San Jacinto mountains, as above noted.

All of our San Jacinto specimens were trapped on or around meadows, but gopher workings were also plentiful on well-drained ridges in the vicinity, as all through the lodge-pole pine belt surrounding Round Valley.

List of Measurements in millimeters of full-grown females of *Thomomys altivallis*

Mus. No.	Sex	Locality	Total Length	Tail Vertebrae	Hind Foot
2188	♀	Tahquitz Valley, San Jacinto Mts.	220	71	30
2190	♀	Tahquitz Valley, San Jacinto Mts.	210	65	29
2193	♀	Tahquitz Valley, San Jacinto Mts.	230	80	30
1761	♀	Round Valley, San Jacinto Mts.	196	60	26
1762	♀	Round Valley, San Jacinto Mts.	209	69	29
		Average of the five ♀♀	213	69	29
		Average of 44 ♀♀ of *T. altivallis* from the San Bernardino Mts.	223	68	30.5

Dipodomys merriami simiolus Rhoads

Allied Kangaroo Rat

Forty-six specimens of this four-toed kangaroo rat were obtained in the San Jacinto region, representing the following stations: Dos Palmos Spring, 3500 feet, ten (nos. 1920–1927, 1938, 1939); Palm Springs, 450 feet, seven (nos. 5348, 5355–5359, 6928); Whitewater, 1130 feet, twelve (nos. 1600–1605, 1612–1617); Snow Creek, 1500 feet, ten (nos. 1606–1611, 1628–1631); Cabezon, 1700 feet, seven (nos. 1315–1321).

These localities will be seen to align themselves strictly within the Lower Sonoran zone on the desert slope of the mountains. At the highest station altitudinally—Dos Palmos Spring—this rodent was associated with *Perodipus agilis*, in our experience an unusual state of affairs, though this is clearly due to the local overlapping of ranges because of the juxtaposition of the desert and coast faunas. Young had appeared in numbers, during the

latter half of May, at the several localities, the earliest noted another chapter (see pp. 388–392).

Dipodomys merriami parvus Rhoads

San Bernardino Kangaroo Rat

This form was found by us only at Vallevista, 1800 feet, at the Pacific base of the mountains. Here it was represented in fair abundance in tracts of brush on the level floor of the San Jacinto Valley. Eleven specimens were secured (nos. 2258–2267, 9364), August 30 to September 3. Five of these are young-of-the-year, the remainder fully adult. All of these appear to be identical with practical topotypes of *parvus* from Cajon Wash, near San Bernardino.

Since there appears to be no adequate description of this species in literature, we offer the following account. In color, *parvus* is distinctly grayer, less ochraceous than *simiolus;* in the former the tint of the colored parts of the hairs dorsally is clay color, in the latter ochraceous buff. In *parvus* the color is much more obscured by the greater amount of dusky tipping to the hairs; this obscuration is greatest in the mid-dorsal region, leaving the sides more purely clay color. In *parvus* the dark markings generally are heavier and hence better defined; the facial markings, soles of hind feet, and tail stripes and tuft are distinctly sooty. The young of the two races show comparable differences, save that in the first pelage of *parvus* the facial markings are obsolete as in *simiolus.*

The accompanying table of measurements shows that in *parvus* and *simiolus* body length is the same, but that *parvus* has slightly shorter tail and hind foot. However, the ranges in dimensions overlap to such a degree that measurements individually have no diagnostic value. It is interesting to note that the range of variation in the size of the two forms appears to be about the same.

As to cranial characters, *parvus* has slightly the smaller skull; the audital bullae are distinctly smaller, and the brain case higher, more bulging on top. The latter two are obviously correlated characters and there are doubtless other dependent features.

Measurements in millimeters of twenty-one specimens of *Dipodomys merriami parvus* from the Pacific drainage of Riverside and San Bernardino counties, California

Mus. No.	Sex	Locality	Date	Total length	Tail vertebrae	Hind foot	Length of body	Ratio tail to body
2262	♂	Vallevista, San Jacinto Valley	Sept. 3, '08	241	146	37	95	154
2263	♂	Vallevista, San Jacinto Valley	Sept. 3, '08	234	140	36	94	149
2265	♀	Vallevista, San Jacinto Valley	Aug. 31, '08	220	127	35	93	136
2266	♂	Vallevista, San Jacinto Valley	Sept. 2, '08	240	138	33	102	135
2267	♂	Vallevista, San Jacinto Valley	Sept. 3, '08	232	132	36	100	132
2541	♂♀	Cajon Wash, near San Bernardino	Oct. 2, '08	228	136	36	92	143
2542	♂	Cajon Wash, near San Bernardino	Oct. 2, '08	219	129	35	90	143
2543	♂	Cajon Wash, near San Bernardino	Oct. 2, '08	235	141	37	94	150
2545	♂	Cajon Wash, near San Bernardino	Oct. 4, '08	235	142	36	93	153
2546	♀	Cajon Wash, near San Bernardino	Oct. 5, '08	224	141	35	83	170
2549	♂	Cajon Wash, near San Bernardino	Oct. 2, '08	230	130	36	100	130
2600	♂	Reche Cañon, near Colton	July 17, '08	238	146	36	92	146
2601	♂	Reche Cañon, near Colton	July 22, '08	234	142	38	92	154
2604	♂♀	Reche Cañon, near Colton	July 16, '08	233	146	39	87	168
2606	♀	Reche Cañon, near Colton	July 22, '08	224	135	36	89	152
2474	♂	Seven miles southeast of Riverside	Sept. 7, '08	240	140	36	100	140
2470	♂	Jurupa Mts., near Riverside	Sept. 30, '08	225	138	36	87	159
2471	♀	Jurupa Mts., near Riverside	Oct. 6, '08	243	147	37	96	151
2472	♂	Jurupa Mts., near Riverside	Oct. 6, '08	225	130	37	95	137
2475	♂	Jurupa Mts., near Riverside	Oct. 7, '08	232	128	35	104	123
7144	♂	Jurupa Mts., near Riverside	Feb. 4, '09	238	132	36	106	124
		Average of all (5♀♀ + 16♂♂)		232	137	36	95	145
		Mean		231	137	36	94.5	146
		Maximum		243	147	39	106	170
		Minimum		219	127	33	83	123
		Per cent of variation on either side of mean		5	7	8	12	16

The geographical distribution of *parvus*, as indicated by the stations listed as part of the table of measurements, lies wholly west of the desert divide, and altogether within the Lower Sonoran zone of certain interior valleys hemmed in between the Santa Ana range of mountains on the southwest and the San Bernardino and San Jacinto mountains on the north and east.

Measurements in millimeters of twenty specimens, both sexes, of *Dipodomys merriami simiolus* from Palm Springs, Snow Creek, Whitewater and Cabezon, on the desert side of the San Jacinto Mountains.

	Total length	Tail vertebrae	Hind foot	Length of body	Ratio tail to body
Average of all (8 ♀♀ + 12 ♂♂)	238	142	38	95	149
Mean	241	144	39	94.5	148.5
Maximum	256	157	42	102	167
Minimum	227	131	36	87	130
Per cent of variation on either side of mean	6	9	8	8	8

Dipodomys deserti deserti Stephens

Desert Kangaroo Rat

Found only at the desert base of the San Jacinto Mountains, whence the Museum contains nine specimens, three (nos. 5903, 6933, 6934) from Palm Springs, 450 feet, and six (nos. 1536–1541) from close to the railroad station at Whitewater, 1130 feet. The species belongs to the Lower Sonoran zone, and does not in this region invade levels above the sand flats of the desert floor.

Perodipus agilis agilis (Gambel)

Gambel Kangaroo Rat

Thirty specimens referable to this species were taken in the San Jacinto region, representing the following stations: Foothills one mile south of Banning, 2200 feet, six (nos. 1418–1423); Schain's Ranch, 4900 feet, six (nos. 1662–1667); Kenworthy, 4500 feet, sixteen (nos. 1818–1827, 1848, 1850, 1859–1861); Carrizo Creek, near Dos Palmos Spring, 3000 and 3500 feet, two (nos. 1916, 1917).

These localities are all within the Upper Sonoran zone; Banning and Dos Palmos Spring are at the extreme lower edge of this zone, where occur also many Lower Sonoran elements; Kenworthy is close to the upper limits of Upper Sonoran. It is of note that in this latter locality all of the kangaroo rats taken were from the sage-brush flat on the floor of the valley, none being found in the chaparral-covered hills on either side. One example here was found freshly caught at 5 p.m. on June 4, indicating unusual diurnal activity.

We have subjected the above-specified series to close scrutiny, both *inter se*, and in comparison with *agilis* from the Pacific slope of Los Angeles County. As far as we are able to discern, there are no good characters existing to warrant separation from *agilis;* neither can we detect differences correlated with the desert and Pacific slopes respectively. The examples from Banning are exactly like those from Kenworthy; also the two from Dos Palmos Spring are indistinguishable from specimens from Kenworthy. As in the case of certain other rodents found at Dos Palmos, the presence of *Perodipus agilis* there may be accounted for as an extreme encroachment down into the edge of the desert area of a Pacific slope form. As noted elsewhere an extraordinary mixture resulted.

Perodipus cabezonae C. H. Merriam

Cabezon Kangaroo Rat

But one example of five-toed kangaroo rat was secured in the vicinity of Cabezon, the type locality of *Perodipus cabezonae.* This specimen is an adult male, no. 1322, taken May 11. It accords closely with Merriam's description. As compared with *agilis,* it is more yellow, with paler face, and hind feet with dusky instead of black soles. In size it is smaller, with especially short tail, measuring: total length 274, tail vertebrae 160, hind foot 40.

No other *Perodipus* secured by us in the San Jacinto region is referable to this form, those even from Banning, only six miles farther up through San Gorgonio Pass, being distinctly different. It is hazardous for us even to conjecture relationships and range upon such inadequate evidence, save that Cabezon is

more emphatically arid Lower Sonoran in its faunal and zonal position than any of the other stations where this genus was found.

Perognathus panamintinus bangsi Mearns

Bangs Pocket Mouse

An abundant rodent on the Lower Sonoran desert base of the San Jacinto Mountains. Represented by specimens as follows: Dos Palmos Spring, 3500 feet, six (nos. 1929–1932, 9354, 9355); Whitewater, 1130 feet, five (nos. 1487, 1488, 1505–1507); Snow Creek, 1500 feet, thirty (nos. 1471–1486, 1491–1504); Cabezon, 1700 feet, twenty-nine (nos. 1356–1364, 1366–1380, 9349-9352); Banning, 2200 feet, two (nos. 1489, 1490). Two of these localities are at the upper edge of Lower Sonoran—Dos Palmos and Banning. The two specimens from Banning show slightly the darkest coloration, perhaps indicating intergradation towards *brevinasus*. This idea is further substantiated by cranial characters, the Banning examples presenting shortish rostra. In neither of these features, however, is the divergence enough to warrant using the name *brevinasus* for the Banning specimens.

All the above listed examples of this pocket mouse were taken in May and June. Two weeks' trapping at Palm Springs in December and January, 1903 and 1904, produced no *Perognathus*. It is evident that this rodent experiences a period of inactivity in winter.

Perognathus panamintinus brevinasus Osgood

Short-nosed Pocket Mouse

Found at but one station, Vallevista, 1800 feet, in San Jacinto Valley. Eight specimens (nos. 2278–2285) were secured there August 31 to September 5. This material shows satisfactorily the characters ascribed to the form *brevinasus*, both as to coloration and proportions of body and cranium. The locality of capture lies at the Pacific base of the mountains, and together with the other known stations of occurrence indicates a range coinciding closely with that portion of the Lower Sonoran zone lying within the San Diegan faunal district. Other localities

represented in the Museum series of this form are: Reche Cañon, near Colton; Garnsey, San Fernando Valley, Los Angeles County; near Wilmington, Los Angeles County.

Perognathus penicillatus angustirostris Osgood

Colorado Desert Pocket Mouse

This species is represented in the collection by but two specimens: no. 1404, from Cabezon, 1700 feet, and no. 1622 from Snow Creek at 1500 feet altitude. This pocket mouse belongs to the low Lower Sonoran zone of the Colorado desert floor, and its relative scarcity within the San Jacinto region as above indicated probably results from our localities of capture being on the extreme margin of its range.

Perognathus fallax fallax C. H. Merriam

Short-eared Pocket Mouse

We refer to this race six specimens secured at Vallevista in San Jacinto Valley (nos. 2272–2277). These were taken in September, and five of them are in fresh winter pelage, the sixth being a juvenal. While this condition of pelage probably accounts in part for their distinctly darker tone of coloration, as compared with the large series of the subspecific representative of the species *fallax* obtained in May and June on the desert base of the San Jacintos, the relative paleness of the latter as compared with the former cannot be altogether due to seasonal causes. The Vallevista specimens are identical with topotypes of *fallax* from Reche Cañon near Colton. Still, as pointed out by Mearns in his description of *P. f. pallidus* (1901, p. 135), the darkest individuals of the species come from still farther towards the coast, so that the Reche Cañon and Vallevista representatives may both be considered somewhat intergradient towards the pale extreme, *pallidus*.

Five adult specimens from Banning (nos. 1465–1469) are distinctly intermediate between *fallax* and *pallidus*, and might have been placed with equal propriety under the latter name. This again indicates that the San Jacinto region occupies a part of the area of intergradation between the coastal race *fallax* and the desert form *pallidus*.

Perognathus fallax pallidus Mearns

Pallid Pocket Mouse

Our collecting showed this to be the most abundant species of coarse-haired pocket mouse around the desert base of the San Jacinto Mountains, where it was found to occupy hilly ground in high Lower Sonoran. The local range of the species may be inferred from the localities of capture, namely: Dos Palmos Spring, 3000 to 3500 feet, twenty-six specimens (nos. 1968–1989, 9360–9363); Palm Cañon at 3000 feet, six specimens (nos. 2059–2061, 2064, 9358, 9359); Palm Cañon near mouth at 800 feet, two (nos. 2062, 2063); Snow Creek, 1500 feet, thirteen (1589–1597, 1618–1621); Cabezon, 1700 feet, twenty-six (nos. 1365, 1381–1403, 9356, 9357).

As remarked under *P. f. fallax*, our small series from Banning, well up towards the top of San Gorgonio Pass, are intermediate towards *fallax*. This is to a perceptible degree also true of some examples from Dos Palmos Spring. In other words, the Snow Creek and Cabezon series are palest; only these justify the employment of a separate name.

Perognathus californicus femoralis Allen

Dulzura Pocket Mouse

Fifteen pocket mice of this species were obtained in the San Jacinto region, eleven (nos. 1651–1661) from Sehain's Ranch, 4900 feet, and four (nos. 2118–2121) from Strawberry Valley, 6000 feet. An additional specimen, believed to be of the same species, was trapped at Hemet Lake, 4400 feet, but was destroyed. All of these localities are close to the line of blending of the Upper Sonoran with the Transition zone. In consideration of the localities of known occurrence in San Diego County (Dulzura, Santa Ysabel, Fair Oaks, Witch Creek, Foster, and Warner Pass) this subspecies belongs clearly to high Upper Sonoran.

In our efforts to ascertain the status of this rodent, we were led to enquire into the relationships existing between the various pocket mice of the *californicus* group. The results of our study fail to coincide with the conclusions formulated in the last monograph of the genus (Osgood, 1900, pp. 57–59). The material

at hand consists of 159 skins with skulls of the *californicus* group from within the state, all catalogued in the Museum of Vertebrate Zoology. These are representative of the following localities: San Mateo County: Redwood City, Portola, and Corte Madera Creek; Santa Clara County: Black Mountain; Monterey County: Monterey and Salinas Valley; San Luis Obispo County: Santa Margarita; San Joaquin County: 8 miles southwest of Tracy; Merced County: 22 miles southwest of Los Banos; Madera County: Raymond; Kern County: Piute Mts., Walker Pass, Weldon, Onyx, Bodfish and Fay Creek; Tulare County: Trout Creek and Jordan Hot Springs; Ventura County: Matilija, Cuddy Cañon; Los Angeles County: Pasadena, Azusa, Glendora; San Bernardino County: Upper Santa Ana River, San Bernardino Mountains; Riverside County: San Jacinto Mountains; San Diego County: Warner Pass, Julian, Witch Creek, Cuyamaca Mountains, Foster.

Each of the characters used by Osgood in diagnosing the species concerned was tested by us with the following results:

(1) Coloration.—We find that in all of the forms, as far as indicated by available material, the fresh fall pelage is much darker, with more of the black hair-tipping, than the spring coat. Taking this fact into account, the coloration of the pocket mice from San Mateo County all the way to southern San Diego County is uniform. This coastal range includes the habitats of *californicus, dispar* and *femoralis*. In the original description of *dispar* (Osgood, 1900, p. 59) paleness of color was one of the emphasized characters. In the light of our material and the evident seasonal change, the character falls. There is, however, a significant paleness attaching to our specimens from the Kern River region. Here then in the arid interior, color does prove diagnostic, and serves to give basis for the recognition of a separate race, *P. c. ochrus* (Osgood, 1904, p. 128).

(2) Quality of pelage.—No appreciable subspecific variation detected by us.

(3) General size.—In the accompanying table of measurements, which takes account only of old adult perfect specimens, it is to be observed that there is no important modification in size southward from the San Francisco Bay region, until the

San Bernardino and San Jacinto Mountain region is reached. From those points south through San Diego County, there is a distinct increase. The matter of size, therefore, fails to argue for a race *dispar;* but it is usable as a fairly good average character for the distinguishing of a form in extreme southern California. It is of further note, however, that even then, the wide range in individual variation destroys the usefulness of this as a specific criterion in a number of individual instances. For example a male from San Mateo County (no. 3862) measures, length 211 mm., tail 120, hind foot 27, this being coincident with the *largest* of the specimens from Witch Creek, San Diego County (male no. 2983).

(4) Cranial features.—As with general size of body there is a slight increase in cranial mass in the series from extreme southern California. But we are unable to discern proportional differences anywhere. The features mentioned by Osgood in this connection are: size of mastoids, degree of arching of cranium, mastoid width, interorbital width, width of nasals and degree of emargination of fronto-nasal sutures. In all these respects there is much individual variation but none that is clearly correlated with geographic areas.

To summarize, there is not, from our material, warrant for recognition of a race *dispar* as distinct from *californicus*. This possibility was anticipated by Osgood (1904, p. 128) in his remarks when describing *ochrus*, where he says: "*P. c. dispar* is itself slightly paler than *californicus*, but the principal reason for recognizing it is its larger size and cranial characters. Should these cranial characters prove inconstant on the acquisition of larger series of true *californicus*, *dispar* would fall as a synonym of *californicus*."

As a further conclusion there now appears no justification for considering *femoralis* as of more than subspecific status, its relationship to be best expressed in the trinomial, *Perognathus californicus femoralis*. The main, if not the only, character of this race as compared with *californicus* is its large size, particularly of hind foot and ear. By our study, the range of the formerly recognized *dispar* becomes divided between that of *californicus* and that of *femoralis*, the range of the latter being

TABLE TO SHOW VARIATION IN SIZE OF RACES OF *Perognathus californicus*

Measurements in millimeters

	Number of specimens	Area represented	Total length			Tail vertebrae			Hind foot			Ear*		
			Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
P. c. californicus	13	Santa Clara, San Mateo, San Joaquin, and Merced counties	202	219	192	111.3	120	101	25.5	27	25	....	....	....
	13	Santa Margarita, San Luis Obispo County	196.3	207	185	105.8	117	96	25.5	27	24	9.3	10	8
	15	Near Pasadena, Los Angeles Co.	202	217	187	115	127	100	26	27	25	....	....	....
	5	Near Azusa, Los Angeles County	199	221	185	112	124	100	26	27	25	....	....	....
P. c. femoralis	8	Santa Ana River, San Bernardino Mts.	211	230	193	119	134	103	27	28	25	....	....	....
	6	Schain's Ranch, San Jacinto Mts.	215	227	203	124	130	118	27.3	29	26	....	....	....
	5	Warner Pass, San Diego County	216	227	200	133	143	121	27	28	26	12	13	11
	3	Witch Creek, San Diego County	206	211	201	113	120	108	27	27	27	12	12	12

* Only field measurements are here used; unfortunately they were not taken in those series where this space is left blank; but general appearances point toward close correlation with hind foot.

extended to include the San Jacinto and San Bernardino mountain regions. It is only fair to state that Stephens (1906, p. 173) argued a similar disposition of the case.

Perognathus spinatus spinatus C. H. Merriam

Spiny Pocket Mouse

But a single example of this species resulted from our collecting in the San Jacinto region: an adult male, no. 2006, trapped August 23 at 3000 feet altitude near Dos Palmos Spring on the desert slope of the Santa Rosa Mountains. The locality of capture was in high Lower Sonoran close to a rocky escarpment—just such a locality as is inhabited by this pocket mouse elsewhere. Our present record affords an extreme southwestern station for the species.

Lepus californicus deserticola Mearns

Colorado Desert Jack Rabbit

Jack rabbits were preserved from the following localities in the San Jacinto region: Kenworthy, 4500 feet, four (nos. 1899, 1900, 2312, 2313); Cabezon, 1700 feet, one (no. 2311); Whitewater, 1130 feet, one (no. 1568); and Palm Springs, 450 feet, one (no. 7040); seven in all. They are all typical examples of *deserticola*, except that the Kenworthy specimens in their slightly darker coloration, tend to approach the coast form *bennetti* (see Nelson, 1909, p. 136).

The species was observed, sometimes in fair abundance, at many points where specimens were not preserved. At Kenworthy, in May and June, and near Hemet Lake in August, one or two were seen almost daily in the sagebrush of the valley. At Dos Palmos in June and in August, they were scattered in small numbers through the brush, as was also the case in the very similar region throughout the lower part of Palm Cañon, and on the floor of the desert below. Noted in fair abundance at Cabezon and Whitewater in May. At Vallevista, August 29 to September 5, jack rabbits were very abundant in the brush of the valley. Nelson (1909, p. 140) records the species from Strawberry Valley, a point where we failed to meet with it, though evidence of the presence of the animal was observed.

The relatively well developed powers of locomotion of this rodent, even though a species primarily of the lowest zone at the arid base, might be held to account for its invasion Pacificwards with its pallid coloration scarcely altered at the farthest station on the more humid side of the mountains. It would appear that the index of dispersal of the desert race *deserticola* is in this region greater than that of the Pacific coast race *bennetti*. As a result characters of desert origin are carried well over upon faunal ground more properly belonging to the darker coast race.

Sylvilagus auduboni arizonae (Allen)

Arizona Cottontail

Judging from the results of our collecting, cottontails would seem to be rather uncommon along the desert base of the San Jacinto Mountains. But one specimen was taken, at Banning, 2200 feet (no. 1470); the species was noted at Cabezon, but none were collected there. There is also a skin from Palm Springs, 450 feet (no. 7036) taken December 31, 1903.

Nelson (1909, p. 220) has referred a specimen from Banning to *S. a. sanctidiegi*, but while our single example is evidently intermediate between that form and *arizonae*, its extremely pale coloration seems to justify its inclusion under the latter. The skull is small, and not noticeably different from those of San Diego specimens.

Evidently the eastern slope of San Gorgonio Pass is with these rabbits, as with several other species of mammals, a region of transition between pallid desert and darker coast forms.

The Palm Springs example, in winter pelage, is darker colored than summer skins of *arizonae* and with little buffy coloration anywhere, but it is distinctly grayish as compared with the richer-colored *sanctidiegi*. The large audital bullae also place it with the desert race.

Sylvilagus auduboni sanctidiegi (Miller)

San Diego Cottontail

Two rabbits taken at Vallevista, 1800 feet, on August 30 and September 4, respectively (nos. 2286, 2287), are evidently

referable to this coast form. Neither in coloration, proportions, nor characters of cranium can they be distinguished from specimens of *S. a. sanctidiegi* from western San Diego County.

Vallevista was the only point where this subspecies was with certainty recognized. Here the rabbits were exceedingly abundant, in the brush-covered washes and on the mesas at the base of the hills.

In the San Jacinto region the rabbits of the *Sylvilagus auduboni* group, represented by the subspecies *sanctidiegi* and *arizonae*, on the coast and desert sides, respectively, appear to be restricted to the Lower Sonoran zone at the base of the mountains, and probably occur nearly continuously around the range, though not uniformly abundant at all apparently suitable spots. Higher up, in the Upper Sonoran zone, the cottontail seems to be entirely replaced by the brush rabbit, *S. bachmani cinerascens*.

Sylvilagus bachmani cinerascens (Allen)

Ashy Brush Rabbit

Eight specimens collected, as follows: Kenworthy, 4500 feet, three (nos. 1901–1903); Dos Palmos Spring, 3500 feet, four (nos. 1904–1906, 2308); Thomas Mountain, 6800 feet, one (no. 2229). Indications of the presence of the species were observed in the vicinity of the Garnet Queen Mine, on Santa Rosa Mountain, 6000 feet, where plentiful sign was noted in the greasewood along the road, at the extreme upper edge of the chaparral belt.

It seems probable that notebook records of "cottontails" seen at Schain's Ranch, 4900 feet, and Poppet Flat, 4000 feet, really pertain to this species. Several were seen at these points June 27 and July 15, but none taken, and as specimens of *S. a. sanctidiegi* were not secured elsewhere in the mountains at this altitude, there is little doubt but that *S. b. cinerascens* was the species observed.

At no point were many brush rabbits seen, a fact possibly due more to the timid and retiring disposition of the animal, and to the nature of its habitat, than to its actual scarcity. At Kenworthy during May and June they were seen from time to time, usually in the early morning or late afternoon, and invari-

ably in the dense brush at the base of the surrounding hills. About Dos Palmos, in June, and again in August, they were occasionally jumped from their hiding places in the bushes, on the more brushy portions of the mesa. Here they were in typically desert surroundings, in our experience a most unusual environment for the species, and due, apparently, to their downward dispersion from the nearby Upper Sonoran hills.

The one secured on Thomas Mountain, the only one seen at this point, is from an altitude (6800 feet) perhaps as high as any previously published record station. Nelson (1909, p. 252) states that in northern Lower California the species ranges up to 6000 feet, into Transition. The limited area of Transition zone along the ridge of Thomas Mountain, open forests of yellow pine inhabited by many Transition zone birds, was invaded at numerous points by tongues of dense Upper Sonoran chaparral, and it was doubtless this feature that carried the brush rabbit as high as the ridge of this mountain.

Nelson's remarks (1909, p. 253) on examples of *S. b cinerascens* from Dulzura, San Diego, and other points along the Mexican boundary, also apply in part to our San Jacinto Mountain specimens. With the color of typical *cinerascens*, the ears of some are distinctly longer than those of specimens from Pasadena and San Fernando. Measurements (ear from notch, in dried skin) in the eight specimens at hand are, average 58.8 mm., extremes 54 to 62. The bullae, however, are not appreciably different in the two series.

Felis oregonensis oregonensis Rafinesque

Pacific Cougar

Well known to the inhabitants of the region. Reported as having recently occurred near Schain's Ranch, on the Strawberry Creek grade and near Hemet Peak, all being localities within the chaparral belt. No specimens were obtained, though individuals were twice encountered by one member of our party, and one was shot at but without result.

This incident occurred on May 27 on the desert slope of the Santa Rosa Mountains at the edge of Deep Cañon close to Black Hill, 3000 feet altitude. The hunter was skirting the rim of

the cañon peering cautiously over each ridge and scrutinizing the landscape for sheep, when the animal was descried bounding down a ravine leading into the cañon. At the first shot the beast stopped short and crouched; at the second it sped on and out of sight down the gorge. On June 1, possibly the same lion or its mate was seen at a distance in almost the same place. This time the animal was executing apparently useless maneuvers across a levelish area sparsely covered with brush. It bounded sinuously across and back again, and in movement and attitudes reminded the observer of the capers of a cat leaping through and over tall grass.

Subsequently the bushes which the animal had hurdled were found to be four feet high; some, more. Lion tracks were seen in the vicinity, where the nature of the ground permitted, and it was presumed that there was a den somewhere down the gorge. Sheep sign was plentiful all about; in fact a band of twelve were jumped from the side of the identical ravine where the first lion was shot at, on the following day, May 28. It is not improbable that the association was voluntary, on the part of the felines.

Lynx eremicus californicus Mearns

California Wild Cat

Reported by local residents from various parts of the region. Three specimens were captured by us: no. 2333, male, Carrizo Creek, 3000 feet, June 20; no. 2335, male, Strawberry Valley, 6000 feet, July 18; No. 2334, male, Tahquitz Valley, 8000 feet, July 26. It is probable that wild cats range all over the mountain and that but one form is represented. Still, the skin from Carrizo Creek, on the desert slope, is so startlingly paler colored than the other two that there might seem good grounds for suspecting the existence of a desert and of a Pacific slope race.

It is evident, however, that the Carrizo Creek animal is considerably more worn: the pelage is more ragged and not so heavy; the tone of color may have been affected, as is believed to be the case in plumage, by the dryer atmosphere and intense light, granting that cats are here abroad in daylight, as they are known to be elsewhere.

Canis ochropus ochropus Eschscholtz

California Coyote

Five specimens of coyotes were obtained as follows: Adult female, no. 2303, at Cabezon, May 8; juvenal female, no. 4397, at Banning, June 8; immature male, no. 2317, at Hemet Lake, August 10; and juvenal male and female, nos. 2314, 2315, at Dos Palmos Spring, May 30.

This material is wholly inadequate for specific determination in so difficult a group, especially in view of the intermediate location of the San Jacinto region. The single adult is in worn and faded pelage; its skull shows characters more nearly of *C. ochropus* than *C. estor,* and this in spite of the locality of capture being at the desert base of the mountains where the latter species would be most likely to occur. The example from Hemet Lake is acquiring clean fall pelage and the colors are more deeply fulvous, as in other examples from the San Diegan district. It is not improbable that all the San Jacinto specimens belong to the small-sized form inhabiting the San Diegan district, but whether or not such a form is to be properly included under the name *ochropus*, or provided with a separate name, has not been determined.

Coyotes, or signs of them, were noted as follows: In the vicinity of Dos Palmos Spring, several adults were seen, singly; and on May 30 four youngsters were discovered on a sand wash near the mouth of a deep ravine heading among some rocky hills. Two of the animals were playing together, tumbling about and biting one another like puppy dogs. As soon as alarmed they all scurried for the ravine, one whining like a scared pup. The sand flat was plentifully sprinkled with their footprints for at least two acres, showing that it had served for some time as their playground. These youngsters were abroad thus in the open, late in the forenoon. No adults were seen at the time.

Coyotes were heard howling nightly around Kenworthy. Sign was seen on Thomas Mountain, 6800 feet, the highest place of observed occurrence of this mammal in the region. One was seen in Strawberry Valley, 6000 feet, July 15.

The stomach of the coyote trapped at Hemet Lake, August 10, contained manzanita berries and bones and fur of small

rodents. Judging from their nocturnal yelping, coyotes were abundant in the vicinity of Vallevista, as also around Cabezon. One was seen from the train between Whitewater and Banning, at noon, June 7.

Vulpes macrotis arsipus Elliot

Mohave Desert Kit Fox

One specimen is in the Museum, obtained on the floor of the desert close to Palm Springs, 450 feet, December 26, 1903. This is an adult male, no. 7091; it resembles closely other examples from the Mohave desert and Colorado River valley. It measures: length 750 mm., tail vertebrae 287, hind foot 123, ear from inner base (in dried skin) 72.

Urocyon cinereoargenteus californicus Mearns

California Gray Fox

Urocyon cinereoargenteus scotti Mearns

Arizona Gray Fox

Foxes proved to be numerous in the San Jacinto region. While this carnivore undoubtedly ranged all over the mountains from the lowest to the highest altitudes, our experience pointed towards the center of its abundance being in the Upper Sonoran chaparral association.

The following facts in regard to food were obtained. The stomach of a fox trapped in Palm Cañon, June 16, contained some juniper berries and fragments of juniper twigs, a number of pieces of skin and bones of lizards, and some rabbit hair. All through the Piñon Flat and Upper Palm Cañon region, feces of foxes were plentifully observed, and consisted largely of the hard seeds of the California juniper. The fruit of this shrub thus appeared to form an important proportion of foxes' food.

Fifteen specimens of the gray fox were secured as follows, adults unless otherwise specified: Schain's Ranch, 4900 feet, female, no. 2708 (skull only); Tahquitz Valley, 8000 feet, July 23, male, no. 2328 (both skin and skull although catalogued are

not now to be found); Thomas Mountain, 6800 feet, August 18–20, four: nos. 2324 male, 2325 female, 2326 female, 2327 female immature; Kenworthy, 4500 feet, May 24, female, no. 2330; Santa Rosa Peak, 7500 feet, June 30, female, no. 2331; Carrizo Creek, in vicinity of Black Hill, 3000 feet, three: male, no. 2332, May 26, female, no. 2318, June 22 (skull now missing), male, no. 2329, August 24; Palm Cañon, 800 feet, June 16, female, no. 2316; Palm Springs, 450 feet, December 23, 1903, female, no. 7094; Snow Creek, 1500 feet, June 2 (skull only, not sexed) no. 7795; Cabezon, 1700 feet, May 8, male, no. 2304.

Two well-marked subspecies of the gray fox inhabit southern California, one occupying the San Diegan district (*U. c. californicus*), the other the Colorado desert (*U. c. scotti*). Of the latter the Museum contains a series of nine specimens; and there is also an adequate series of *californicus* from the Pacific slope of southern California.

The Colorado River series (*scotti*) shows the following characters as compared with *californicus*: Coloration paler, less brightly rufous, and white endings of hairs on sides of body and tail, and on top of head, more extensive on each hair, resulting in a more silvery gray general effect. The skull is relatively more slender, the teeth slenderer and sharper; bullae more inflated; that is, relatively higher and steeper-sided; rostrum conspicuously narrower, possibly correlated with the weaker teeth.

The San Jacinto series of foxes, as we have found to be the case with so many other mammals, notably the white-footed wood rats, presents a condition of varied intermediateness, and includes also certain examples which are quite satisfactorily referable to one form or the other. As is to be expected on geographical grounds the good *scotti* are from the desert side, good *californicus* from the highest zones and the Pacific side.

Unfortunately for color characters nearly all the San Jacinto skins are in very worn and more or less faded summer pelage. As in the case of the wildcats, the foxes from the arid side of the range had suffered much more in these respects than those from the Transition zone and Pacific side. August examples from Thomas Mountain are in good enough pelage to warrant certain diagnosis as *californicus*. Our one winter skin, from Palm

Springs, is, in its pale and conspicuously silvery hue, unequivocally *scotti*. In February, 1912, the senior author saw at Palm Springs five skins of foxes recently trapped at the rocky base of the foothills close by; these, also, were readily recognizable as the pale *scotti*, rather than *californicus*.

The skulls furnish the best basis for determining individuals. Those from Palm Springs and Carrizo Creek are very close to the average of *scotti*. One from Cabezon, however, and another from Palm Cañon, although also on the desert side, are much more nearly *californicus*. The relative inflation of the audital bullae is a particular feature of uneven variation, and on this character alone segregation by locality shows no geographical orderliness. In other words there is no regularly progressive change in the character from point to point in a direct line from one faunal area into the other.

Again, as with the *desertorum* group of wood rats, the foxes of the San Jacinto region appear to show the results of continued interbreeding of two low-zone races of animals whose habitats here abut. The line of faunal mergence is so narrow that there is no room for gradual blending as is usually exhibited between races when the faunal transition occupies a much wider extent of country (as compared with the powers of locomotion of the species concerned). Instead, the intermediates are heterogeneous in their exhibition of characters, and are thus more in the nature of hybrids than geographic intergrades, if each term be used in the sense in which it is commonly employed in systematic mammalogy. In the San Jacinto foxes it is clearly just as much geographic intergrading in a real sense as if all the animals from any one point along a line from one habitat to the other were uniform, and as if similar representations from the series of points aligned themselves in even gradation from one extreme to the other, instead of there being a conspicuous irregularity in all respects, as is the case.

Salient facts are: the Colorado River series and a series from the coast district of California are each uniform within narrow limits of individual variation; the San Jacinto series is widely variable, including extremes referable to each subspecies and examples showing various combinations of characters.

It is unfortunate that the name *californicus* was based on a type from the San Jacinto region (Mearns, 1897, p. 459). Said type is very likely not to have represented the best manifestation of the subspecies inhabiting the San Diegan faunal area. In other words the type was probably not typical of the race to which the name *californicus* is held to apply. Such a circumstance is common in the early history of the systematic mammalogy of any country.

Procyon psora psora Gray

California Coon

No specimens were procured; but fresh footprints were seen along the creek in Strawberry Valley, 6000 feet, July 9; and we were assured of the occurrence of coons around Hemet Lake, 4400 feet. Both these localities are on the Pacific drainage.

[Ursus horribilis californicus Merriam

California Grizzly

It is many years since bears have been seen in these mountains. The California grizzly was formerly abundant, so much so as to be a constant menace to the cattle belonging to the first settlers in the mountain valleys, and the bears were consequently shot, trapped, and poisoned upon every occasion, to their extinction, which took place in this range about 1890. A few old log bear traps may still be seen in the brushy hills bordering Thomas and Coahuila valleys.

The above statement is made chiefly upon the authority of H. E. Wilder.**]**

Mephitis occidentalis holzneri Mearns

Southern California Striped Skunk

Fifteen specimens of this skunk were trapped, and preserved either as skins with skulls or skulls only. The localities and Museum numbers are as follows: Thomas Mountain, 6800 feet, one (no. 2323); Hemet Lake, 4400 feet, two (nos. 2321, 2322); Strawberry Valley, 6000 feet, two (nos. 2249, 2250); Schain's Ranch, 4900 feet, five (nos. 1623, 8864–8867); Cabezon, 1700

feet, three (nos. 2305, 2306, 7796); Snow Creek, 1500 feet, two (nos. 2307, 8863). In February, 1912, a skin of one was seen at Palm Springs, caught recently at the base of the foothills near there. It will be observed that these stations are chiefly within the Upper Sonoran zone, though the species ranges a little above and a little below. This is wholly in accord with the preferences of *Mephitis* elsewhere in southern California.

Stomach examination showed in one case bones and fur of a *Microtus;* in another case berries and leaves of manzanita together with bones and fur of an unrecognizable species of small mammal; in a third case the stomach was filled to distention with "Jerusalem" crickets (*Stenopelmatus*), while there were fragments of legs and other hard parts of these insects in the feces. A remarkably varied diet is thus indicated.

Spilogale phenax phenax C. H. Merriam

California Spotted Skunk

Specimens secured as follows: adult male, no. 1898, Kenworthy, 4500 feet, May 24; young male, no. 1907, Carrizo Creek, 3000 feet, June 22; adult male, no. 2302, Cabezon, 1700 feet, May 11. These localities range from high Upper Sonoran down well into Lower Sonoran—the usual zonal range of the species elsewhere in southern California.

Mustela arizonensis (Mearns)

Mountain Weasel

A single specimen was captured in Tahquitz Valley, 8000 feet, July 23. It was caught in a gopher trap, of the box pattern, open at one end, with heavy spring released merely by the animal's pushing against the trigger. This trap had been set in the meadow sod in the usual way for gophers, and the fact that it produced a weasel gives insight into the forage methods of the carnivore. One other instance of the presence of weasels in the region came to our attention: A skin of one was seen in the possession of a cattle man at Fuller's Mill, 5900 feet, July 2; it had been caught in the near vicinity a few days previously.

Our one specimen (male, no. 2167) probably represents the form occupying the San Jacinto region above the Sonoran zone. Its features in comparison with *arizonensis* from northern Nevada, have been commented upon at length by Taylor (1911, p. 299). We now have for comparison four summer adults from the Mount Whitney region of the extreme southern Sierra Nevada. The San Jacinto animal is closely similar to these, but slightly paler, especially in the brownness of the head, and is somewhat smaller. It measures, length 328 mm., tail vertebrae 113, hind foot 37.

There is very great variation among all the California specimens of this species in extent of facial white markings; for instance, one example (no. 16272, female, Monache Meadows, 8000 feet, Tulare County) has as much white on the cheeks and between the eyes as the extreme of *Mustela xanthogenys*. It does not appear that good characters are to be sought in this direction, but rather in size, proportions, and general tone of coloration.

C. H. Merriam (1896, p. 25) has suggested that *M. xanthogenys* seems to grade into *arizonensis* up the mountains. If this be true (though not shown by our rather limited material) then *arizonensis* of San Jacinto Peak might be considered nearest related to *xanthogenys* of the adjacent lowlands of southern California—in fact merely a mountain form directly derived from that species, and not to be thought of as an isolated colony of a species having its nearest relative on the high southern Sierras. The same material lends itself equally to the two theories. Because of parallel distribution among other mammals of the two regions in question, however, we lean to the latter notion.

San Jacinto Peak is the southernmost station for *arizonensis* in California.

Sorex ornatus C. H. Merriam

Adorned Shrew

Found only in Strawberry Valley, 6000 feet, and Tahquitz Valley, 8000 feet. Four specimens were trapped (nos. 2090, 2149–2151), the first in the former locality, July 18, and the last three in the later locality July 20, 25 and August 1. All are adults in summer pelage, and fairly typical of *ornatus*.

In each case the capture of a shrew was a wholly fortuitous event. When special pains were taken in setting and baiting, with shrews particularly in view, nothing resulted. All the shrews were trapped in mouse traps baited with rolled oats. In one case the victim was clipped over the rump backwards, showing that it had been merely running over the trap.

The specimen from Strawberry Valley was caught beneath an overhanging mat of roots four inches from running water, the whole place over-shadowed by alders. In Tahquitz Valley the shrews were caught beneath willows and veratrum plants on and around the meadows.

As far as shown by our collecting, this species in this region belongs to the riparian association of the Transition zone.

Notiosorex crawfordi Baird

Desert Shrew

A single specimen secured (no. 1928) near Dos Palmos Spring, 3500 feet, May 31. This was caught in a mouse trap set on the bare sandy ground of a broad mesa among yuccas and cactus (see pl. 10, fig. 1). The trap was baited with rolled oats; but the fact that a grasshopper was found crushed in the trap along with the shrew makes it likely that first the insect was attracted by the oats, thus constituting itself a "live bait" which in turn attracted the shrew.

Other mammals found in the same line of traps the same morning were *Perodipus*, *Dipodomys*, two species of *Perognathus*, a *Peromyscus*, a *Neotoma*, and an antelope chipmunk—a most incongruous assemblage! The shrew was not nearer than 150 yards to the nearest portion of the watercourse.

The specimen is a fully adult female in molt, the pelage dorsally being patchy, plumbeous and dull brownish. The measurements are: length 82 mm., tail vertebrae 28, hind foot 10. The mammae were large, evidently functioning.

Scapanus latimanus occultus Grinnell and Swarth

Southern California Mole

Signs of moles came to notice very generally over the San Jacinto and Santa Rosa mountains. Surface runways were seen

in Tahquitz Valley and on the trail leading from there to Round Valley; also on the summit of Santa Rosa Peak and around Hemet Lake. The lowest points at which evidences of their presence were noted were on the desert slopes and base of the mountains, at Banning and Snow Creek, the elevation of the latter point being 1500 feet. These may be considered extreme eastward stations for the species, as moles are unknown from the desert proper beyond.

But two examples were procured in the region under consideration: female, no. 2089, in Strawberry Valley, 6000 feet, July 15, and a female, no. 2231, on Thomas Mountain, 6800 feet, August 19. The first was captured as a result of the collector's seeing a slight movement of the earth at the end of a mole ridge, the animal being impaled by a quick thrust of a pronged instrument. The second was caught in a special mole trap.

For the use of the name *occultus* for the mole of southern California, see Grinnell and Swarth (1912a, p. 131).

Corynorhinus macrotis pallescens Miller

Pallid Big-eared Bat

Found only in a mine tunnel at about 6500 feet altitude, on the south face of Hemet Peak, and about two miles from Kenworthy. The hillside upon which the tunnel opened was Upper Sonoran, but temperature conditions where the bats were roosting were certainly altogether different from those outside, both day and night. The tunnel was 600 feet long with a vertical shaft at the end admitting air from above. A strong and, even at midday, very cold draft descended the shaft and thence flowed out through the tunnel.

The bats were found by means of candle light, clinging singly to the side walls of the tunnel, from within a few feet of the entrance nearly to the end. Here seventeen *Corynorhinus*, the only species of bat found in this locality, were obtained, on May 22 and June 5, twelve being preserved as skins with skulls (nos. 1882–1893) and five as alcoholics (nos. 9365–9369). There were fifteen males and two females; one of the latter containing a single large foetus.

On both dates all the bats when found were cold to the touch, and were apparently numb, being incapable of any but very slow movements. Within a few minutes, however, after being taken into the outside warmth, they became very active and squeaked gratingly. A curious position was that occupied by the ears when the bats were at roost. Although this was a species with relatively enormous ears, these structures were scarcely visible when the animals as first found hung against the rock surfaces head down. Upon close examination, the ears of the inverted pendant bat were found to be folded against the sides close to the body and almost completely hidden by the wings, which were held together in front, that is, against the rock. This means that the pinna was actually bent over sharply, a number of wrinkles resulting, but apparently in no degree incapacitating the conch from springing back into its wonted posture when released.

Myotis lucifugus longicrus (True)

Long-legged Bat

A female adult (no. 1306) from Cabezon, 1700 feet, May 13. This occurrence is low, zonally, for the species, but the early date may indicate a migrant. Three adult females (nos. 2041–2043), Santa Rosa Peak at 7500 feet, June 30. These were obtained in the vicinity of a spring, at late dusk, where they came to drink. There was a series of pools in the rocky bed of a steep ravine. These provided an open approach from down the cañon, a bat flying directly to a pool, dipping to the surface of the water and hovering for an instant, leaving a slight ripple. One was caught in a butterfly net as it dipped to drink, the others were shot above open ground below the pools. One of the bats contained a foetus.

This species is usually found in summer in the mountains of southern California, in the Transition zone. The station on Santa Rosa Peak was in this zone.

Myotis yumanensis yumanensis (H. Allen)

Yuma Bat

Taken by us but once: male adult (no. 9374), Hemet Lake, 4400 feet, August 20; caught in a bunk house. This specimen

is preserved as an alcoholic, but the skull has been removed and cleaned.

Myotis orinomus Elliot

La Grulla Brown Bat

Five specimens secured: nos. 2044–2047, at Garnet Queen Mine, 6000 feet, June 25 and 26; no. 2248, Hemet Lake, 4400 feet, August 9. Both localities are in high Upper Sonoran on the Pacific Slope; in both places some transition elements were present, and it is possible though not probable that this bat belongs to Transition.

Upon the basis of our San Jacinto material, this species was first credited to the mammal fauna of the state (see Grinnell and Swarth, 1912b, p. 137).

Myotis californicus californicus (Audubon and Bachman)

California Little Brown Bat

Small bats were observed at several of the stations on the Pacific side of the mountains. Our inability to distinguish the species of *Myotis* out of hand necessitates the ignoring of all occurrences except where specimens were actually obtained.

Of *californicus* only two examples were taken: adult male (no. 1894), Kenworthy, 4500 feet, June 8; female juvenal (no. 2707), Schain's Ranch, 4900 feet, July 14. Both of these localities are at the extreme upper edge of Upper Sonoran.

Eptesicus fuscus fuscus (Beauvois)

Big Brown Bat

Bats of this species were obtained as follows: Kenworthy, 4500 feet, May 24 and June 5, four (nos. 1864–1867); Tahquitz Valley, 8000 feet, July 22, two (nos. 2152, 2153); Hemet Lake, 4400 feet, August 13 and 14, two (nos. 2246, 2247); Lower Palm Cañon, 800 feet, June 16, one (no. 9375). As elsewhere in southern California this bat is most numerous in the high Upper Sonoran and Transition zones, ranging highest of any member of the order. Yet it was also found well down into Lower Sonoran, though only along cañons down which individuals may fly nightly from roosting places higher up. Large bats presumed

to be of this species were seen at almost every station, so that taking into account the localities of fair certainty together with those of actual capture, a greater zonal and faunal range is indicated for *Eptesicus* than for any other bat of the region.

The specimens taken show much variation in color, and the remarks made in regard to a series from the San Bernardino Mountains apply here (see Grinnell, 1908, p. 159).

Pipistrellus hesperus hesperus (H. Allen)

Western Bat

Eleven specimens were preserved as follows: vicinity of Dos Palmos Spring, 3000 to 3500 feet, May 28 and August 25, six (nos. 1895–1897, 1918, 1919, 9373); Palm Cañon, June 13 and 16, three (nos. 9370–9372); Cabezon, 1700 feet, May 7, one (no. 1307); Banning, 2100 feet, June 9, one (no. 1462). There is also in the Museum a skin (no. 6938) taken at Palm Springs, 450 feet, December 29, 1903; this was shot at dusk as it flew overhead above a patch of mesquites. Several were seen in flight at early dusk in the same locality, February 9 and 13, 1912. The occurrence of the species abroad in midwinter is of interest, as we have no evidence otherwise as to whether or not the species is migratory.

This small bat was identified with certainty only on the desert side of the San Jacinto Mountains, and, as shown above, appeared to be restricted to the Lower Sonoran zone. Very many appeared at early dusk along Palm Cañon and in the neighborhood of Dos Palmos Spring, where they were seen to emerge from crevices of rocks. This was the only species of bat seen abroad after sunrise and before sunset; in fact one individual was seen in flight about 9 A.M. in the bright glare of the forenoon sun.

BOREAL FAUNA OF SAN JACINTO PEAK COMPARED WITH THAT OF OTHER MOUNTAINS OF SOUTHERN CALIFORNIA

Although the Boreal zone of the San Jacinto area is sharply cut off on all sides, and is thus completely isolated at the present time from other areas of similar fauna, there is good reason to suppose that during a more or less remote period, of cooler climate, there was zonal continuity with the adjacent ranges and these in turn with the vast Boreal area believed to have once prevailed over the Great Basin region and to have included the Sierra Nevada. Changes in topography so modified meteorological conditions that the zones of life of necessity retreated northwards and upwards until restricted to the higher elevations now distantly separated from one another.

The mammals and birds of the high mountains of southern California in every case are either identical with, or show close relationship to, forms now existing in the Sierra Nevada.

In reviewing the Boreal biota as found to occur on San Jacinto Peak, the first thing to attract particular attention was the relative paucity of types as compared with the number of types in the San Bernardino Mountains previously studied (Grinnell, 1908). As shown in the accompanying table there are seven distinctly Boreal mammals and twenty-eight Boreal birds on the San Bernardinos, while there are but five mammals and twenty-two birds of like zonal restriction on the San Jacintos. Only one (*Mustela arizonensis*), out of the whole number belonging to the San Jacintos, has not been found on the San Bernardinos, and the probabilities point towards its existence there also. Otherwise all of the San Jacinto species are found on the other mountain mass. These relative conditions are closely paralleled in a study of the plants of the two areas (see Hall, 1902, pp. 47, 48).

This disparity in Boreal representation appeared to be without explanation, until it occurred to us that there might be some correlation between size of the areas concerned and numbers of

species inhabiting them. Obviously the San Jacinto area of Boreal is much smaller than that on the San Bernardino Mountains.

We proceeded to compare corresponding conditions elsewhere in southern California, with the results shown in the accompanying tables and diagram (see pp. 386, 387, and pl. 7). Examination of a zone map of southern California shows the Boreal zone to be represented in a series of isolated areas of varying limited extent, these in most part marking the crest of the main divide separating the desert and Pacific drainages.

From the Mount Whitney region of the southern Sierra Nevada this divide swings more and more to the westward until the vicinity of Mount Pinos is reached. Here it bends abruptly at almost right angles in a southeasterly trend, which is roughly maintained at least to the Mexican line. The diagram (plate 7) is constructed as though this backbone were in a straight line, and serves to show the relative extent of the isolated areas of Boreal included.

The Boreal life zone on San Jacinto Peak is seen to be larger in area than any others of the many mountain masses of southern California, excepting the San Bernardino Mountains; the number of Boreal types existing upon it exceeds those on any others of the mountains coming into the problem, excepting, again, the San Bernardinos.

It might be suspected that degree of remoteness from the very large Boreal area of the main Sierra Nevada would bear direct relation to number of species represented upon these detached mountains. According to this idea, the Sierras would have provided the mother fauna, and the farther the emigration of types along a possible line of dispersal, the fewer the survivors. Thus Mount Pinos would share with the Sierra Nevada a larger proportion of its species than any of the appropriate areas to the south. But we find no such condition in fact. There are two Boreal mammals and seventeen Boreal birds on Mount Pinos as compared with seven and twenty-eight, respectively, on the San Bernardinos, and five and twenty-two on the San Jacintos. Rather, does it appear that the number of forms is associated with the size of area concerned.

According to the hypothesis already expressed, the detached tracts of the Boreal zone on the mountain masses of southern California are inhabited by residual faunas representative of that which was spread continuously along the divide in earlier times. The facts show that fewer types have been preserved in one place than another, and further that the following statement of a possible law appears to be justified: *The smaller the disconnected area of a given zone (or distributional area of any other rank), the fewer the types which are persistent therein.*

Although formulated upon the basis of study in a restricted region we believe the above generalization will prove of wide applicability. Reference to the fauna of such a continental archipelago as the Santa Barbara group of islands, shows that, among themselves and as compared with the mainland, in richness of fauna as to species possessed (but *not* necessarily as to *individuals*), a very similar state of affairs exists. But this relationship must not of course be expected everywhere absolutely without exception, because of occasional extraordinary circumstances of overwhelming effect.

If our generalization is found to bear the test universally, then it is certainly fallacious to establish lines of dispersal and centers of distribution upon such data as the relative numbers of types found to occupy the regions studied, *unless size of the areas in question be taken into account.*

It is highly probable that the extinction of species (and thus, of course, of larger groups) has been hastened by restriction of habitat. Comparison of areas of similar climatic conditions, with regard to size and number of endemic forms (such as has been made in the present article), comes very near to proving this point.

The query arises as to the cause of more rapid disappearance of types in such cases, even though they may hold, each, unchallenged possession of a separate ecologic niche. This cannot be answered from positive data. But it seems inevitable that the smaller the area available to a species (whether a sea-girt oceanic island or a patch of the Boreal zone completely surrounded by Sonoran, as on the San Jacintos) the greater the chance for complete extinction of the species from such causes

as recurring periods of extreme food shortage, epidemic disease, and cataclysmic disturbances of either climate or topography.

Table (1) showing relative numbers of boreal mammals represented on the different mountain masses of southern California. Note the correlation of *numbers of types* with *size of the detached area* of Boreal (and Transition) zone in each case (see profile, pl. 7).

	Mt. Whitney Region	Mt. Pinos	San Gabriel Mts. (not well known)	San Bernardino Mts.	San Jacinto Mts.	Santa Rosa Mts.	Cuyamaca Mts.
Marmota flaviventer	x	..	..	..	..	..	..
Callospermophilus chrysodeirus, subsp.	x	..	..	x	..	..	..
Eutamias alpinus	x	..	..	..	..	..	..
Eutamias speciosus, subsp.	x	x	..	x	x	..	..
Sciurus griseus, subsp.	x	x	x	x	x	x	x
Sciurus d. albolimbatus	x	..	..	..	..	..	..
Sciuropterus alpinus, subsp.	x	..	..	x	x	..	..
Neotoma c. cinerea	x	.	..	..	..	..	..
Microtus m. dutcheri	x	..	..	..	..	..	..
Microtus mordax, subsp.	x	..	..	x	..	..	..
Thomomys alpinus + T. altivallis	x	..	..	x	x	..	..
Zapus t. alleni	x	..	..	..	..	..	..
Erethizon epixanthum	x	..	..	x	..	..	..
Ochotona albatus	x	..	..	..	..	..	..
Lepus c. sierrae	x	..	..	..	..	..	..
Canis lestes	x	..	..	..	..	..	..
Vulpes necator	x	..	..	..	..	..	..
Gulo luteus	x	..	..	..	..	..	..
Mustela arizonensis	x	..	..	..	x	..	..
Neosorex p. navigator	x	..	..	..	..	..	..
Total number of species	20	2	1	7	5	1	1

Table (2) showing relative numbers of boreal birds represented on the different mountain masses of southern California. Note the correlation of *numbers of types* with *size of the detached area* of Boreal (and Transition) zone in each case (see profile, pl. 7).

	Mt. Whitney Region	Mt. Pinos	San Gabriel Mts.	San Bernardino Mts.	San Jacinto Mts.	Santa Rosa Mts.	Cuyamaca Mts.
Dendragapus o. sierrae	x	x	..	..	..	..	..
Otus f. flammeolus	x	..	..	x	..	..	..
Xenopicus albolarvatus, subsp.	x	x	x	x	x	x	x
Sphyrapicus v. daggetti	x	..	..	x	x	..	..
Sphyrapicus thyroideus	x	..	..	x	x	..	..
Chordeiles v. hesperis	x	..	..	x	..	..	..
Stellula calliope	x	x	x	x	x	..	..
Nuttallornis borealis	x	x	x	x	x	x	x
Empidonax wrighti	x	..	x	x	x	x	..
Cyanocitta s. frontalis	x	x	x	x	x	x	x
Nucifraga columbiana	x	x	x	x	x	x	..
Carpodacus cassini	x	x	x	x	x	..	..
Loxia c. bendirei	x	x	..	x	x	.	.
Leucosticte t. dawsoni	x	..	..	..	..	..	..
Spinus p. pinus	x	x	x	x	x	x	..
Zonotrichia l. leucophrys	x	..	..	..	..	..	..
Junco o. thurberi	x	x	x	x	x	x	x
Melospiza l. lincolni	x	..	..	x	x	..	..
Passerella i. stephensi	x	x	x	x	x	..	..
Oreospiza chlorura	x	x	x	x	x	..	..
Dendroica a. auduboni	x	x	x	x	x	x	..
Certhia f. zelotes	x	x	x	x	x	x	x
Sitta canadensis	x	..	..	x	x	..	..
Sitta pygmaea, subsp.	x	x	x	x	x	x	x
Penthestes gambeli, subsp.	x	x	x	x	x	x	x
Regulus s. olivaceus	x	..	..	x	x	..	..
Regulus c. cineraceus	x	..	x	x	x	..	..
Myadestes townsendi	x	..	..	x	..	..	..
Hylocichla g. sequoiensis	x	..	..	x	..	..	..
Planesticus m. propinquus	x	x	x	x	..	..	..
Sialia currucoides	x	..	..	x	..	..	..
Total number of species	31	17	17	28	22	11	7

SONORAN BIOTA OF THE SAN DIEGAN DISTRICT COMPARED WITH THAT OF THE ADJACENT DESERT

The San Jacinto area includes a section of the divide between the desert and Pacific slopes of southern California. Only a small portion of this divide, however, is taken up by the Boreal zone (see pls. 6, 7). Over a large part of the area the Sonoran zones are continuous over the divide from the desert to the Pacific side. It is almost altogether the upper division of the Sonoran zone which tops the watershed, a narrow and diluted strip of Lower Sonoran extending over the low San Gorgonio Pass.

While the Sonoran zone is thus continuous from the Pacific side over upon the desert, the fauna undergoes marked and rather abrupt change. To refer to basic causes, we may say that while aestival temperature is similar on the two slopes, degree of humidity is widely different. The great difference in *dryness* on the two sides of the San Jacinto Mountains is impressed upon the traveler in many sensible ways, so that recourse to a hygrometer is unnecessary to prove to him the nature of the change. Species and *genera* replace one another *up* the mountain, that is, from zone to zone, being segregated by temperature conditions; species and *subspecies* replace one another *across* the divide, from faunal district to faunal district, being controlled in their respective distribution by atmospheric humidity.

That the metamorphosis in biotic complexion from the Pacific to the desert is correlated with decrease in relative humidity is proved by the fact that replacement of species occurs on an average along the line where the obviously humid and dry areas meet. In the San Jacinto area studies of faunal behavior can be prosecuted under particularly favorable conditions, because this line of mergence between humid and arid faunal districts takes place within such a very short distance, and further because, while the Pacific side is not so very humid, as compared with the northwest coast belt of the United States, the desert side possesses an extraordinarily less percentage of humidity. The

degree of difference is so great that violent contrast is afforded in meteorological conditions and in their resultant effects on the plant and animal life.

The relatively semi-humid province occupying the Pacific slope of southern California has been termed the San Diegan District. The opposite slope leads down to the Colorado Desert, and this latter geographic name may be used for the faunal division which includes it.

The transition from semi-humid to extreme arid does not occur at the very summit of the divide at any point. Because of the prevailingly westerly winds the San Diegan condition and biota are carried over upon the desert slopes to varying distances beyond the crest according to steepness and trend of the ridges which deflect the moist air-currents.

An analysis of the Sonoran birds and mammals of the San Jacinto area by species leads to the following groupings according to nature of distribution: (1) Species which occur regularly in both the San Diegan District and on the Colorado Desert, and which show no distinctive modifications in the two areas (see table A); (2) species which are separately confined to one or the other fauna, and so sharply delimited associationally that they do not even invade the strip over which the two faunas blend (see table B); (3) species which belong intrinsically to one or the other area but which penetrate across the strip of blending and even into the frontier of the opposite area (see table C); (4) species represented in each of the two areas, but by obviously closely related forms, either subspecies, or species but slightly differentiated (see table D).

The first category consists of species, all birds, of apparent indifference to conditions of humidity. They range for the most part widely over the western United States, and, with the notable exception of the cactus wren, either perform regular and extended migrations, or are of strong flight and vagrant inclination.

The second category comprises species which occupy very narrow ranges of environmental conditions, so limited that in some cases the confines of a single association are not overstepped. As examples of such extreme delimitation, *Dipodomys deserti*, of the aeolian sands, and the crissal thrasher, of the

mesquite belt, may be cited, as from the desert fauna; and the Hutton vireo, of the live oak association, and Bell sparrow, of the *Adenostoma* association, as belonging to the San Diegan fauna. These species must be of extreme dependence upon one or more factors of their surroundings.

The third category shows an intermediate degree of adaptability or indifference as compared with the first and second. In four cases species of prevalently desert habitat range over on the Pacific side of the San Jacintos, either continuously, as with *Lepus c. deserticola* and *Peromyscus m. sonoriensis*, or are represented within "islands" of the Lower Sonoran zone, as with *Ammospermophilus l. leucurus* and *Dryobates s. cactophilus* in the San Jacinto Valley. On the other hand, and in a greater number of cases, San Diegan species range to a considerable distance down over the arid side of the mountains, becoming thus exposed, in some cases, to an extreme of desert conditions. All those listed are of practically continuous range, except the San Diego song sparrow, the desert side colonies of this riparian species being of necessity cut off from their parent stock (see p. 279).

The fourth category includes some of the species classified in the third. These and the additional ones are peculiar in that there are complementary forms in the two contiguous faunas. Some of these blend together gradually over the neutral strip and thus in each case constitute subspecies of a common species, in accordance with the understanding of the term subspecies among American vertebrate systematists at the present time; for example, the Lower Sonoran *Perognathus panamintinus*, with its subspecies *bangsi* and *brevinasus* intergrading through San Gorgonio Pass. Others of the forms are connected by a broken series of intermediates (see under *Xenotoma intermedia* and *desertorum*, pp. 336–347). In a few cases there are unquestioned hybrids of more or less frequent occurrence, as between the quails, *Lophortyx gambeli* and *L. c. vallicola*. And finally there are perfectly distinct though obviously closely related forms in the two faunas, as, for example, *Polioptila plumbea* and *P. californica*, and *Dryobates s. cactophilus* and *D. nuttalli*.

A

Species which are the same in the San Diegan district and in the Colorado Desert region

Zenaidura m. carolinensis
Cathartes a. septentrionalis
Accipiter cooperi
Buteo b. calurus
Speotyto c. hypogaea
Geococcyx californianus
Chordeiles a. texensis
Aeronautes melanoleucus
Archilochus alexandri
Calypte costae
Myiarchus c. cinerascens
Empidonax t. trailli
Corvus c. sinuatus
Icterus c. nelsoni
Carpodacus m. frontalis
Astragalinus p. hesperophilus
Petrochelidon l. lunifrons
Stelgidopteryx serripennis
Phainopepla nitens
Vireo b. pusillus
Icteria v. longicauda
Mimus p. leucopterus
Heleodytes b. couesi
Salpinctes obsoletus

B

Species which are sharply defined in range, on either the Desert side or Pacific side

Desert (with no Pacific race)

Ovis c. nelsoni
Citellus t. chlorus
Peromyscus c. stephensi
Thomomys perpallidus
Dipodomys deserti
Perognathus p. angustirostris
Perognathus spinatus
Icterus parisorum
Amphispiza b. deserticola
Toxostoma crissale
Auriparus f. flaviceps

San Diegan (with no desert race)

Perognathus c. femoralis
Calypte anna
Aphelocoma c. californica (?)
Amphispiza belli
Vireo h. huttoni
Chamaea f. henshawi
Baeolophus i. murinus
Psaltriparus m. minimus

C

Desert species which range notably over into San Diegan conditions

Ammospermophilus l. leucurus
Peromyscus m. sonoriensis
Lepus c. deserticola
Dryobates s. cactophilus

San Diegan species which range over into desert conditions

Citellus b. fisheri
Peromyscus c. insignis
Perodipus agilis
Sylvilagus b. cinerascens
Spilogale phenax
Lophortyx c. vallicola
Melospiza m. cooperi
Pipilo m. megalonyx
Pipilo c. senicula
Toxostoma r. pasadenense
Thryomanes b. charienturus

D

TYPICAL DESERT MAMMALS AND BIRDS THAT MAY BE CONSIDERED AS HAVING RELATED FORMS ON THE PACIFIC SLOPE

Desert or stock form	*Pacific Coast race*
Onychomys t. torridus	Onychomys t. ramona
Peromyscus e. eremicus	Peromyscus e. fraterculus*
Neotoma i. desertorum	Neotoma i. intermedia
Dipodomys m. simiolus	Dipodomys m. parvus
Perognathus p. bangsi	Perognathus p. brevinasus
Lepus c. deserticola	Lepus c. bennetti*
Vulpes m. arsipus	Vulpes m. macrotis*
Pipistrellus h. hesperus	Pipistrellus h. merriami*
Lophortyx gambeli	Lophortyx c. vallicola
Dryobates s. cactophilus	Dryobates nuttalli
Pipilo (aberti)	Pipilo c. senicula
Toxostoma l. lecontei	Toxostoma r. pasadenense
Polioptila plumbea	Polioptila californica

PACIFIC SLOPE MAMMALS AND BIRDS THAT MAY BE CONSIDERED AS HAVING RELATED RACES ON THE DESERT

Pacific Coast or stock form	*Desert race*
Citellus b. beecheyi*	Citellus b. fisheri
Neotoma f. macrotis*	Neotoma f. mohavensis
Thomomys nigricans	Thomomys cabezonae(?)
Perodipus agilis	Perodipus cabezonae(?)
Perognathus f. fallax	Perognathus f. pallidus

* Not found by us within the San Jacinto area, although well known to occur in the San Diegan district.

THE BEHAVIOR OF GEOGRAPHIC RACES ON THE MARGINS OF THEIR HABITATS

In explanation of the diversity in behavior of geographic races on the margins of their habitats, as pointed out in the preceding section of our report, we may suggest that the direction of invasion of strains, whether from the desert towards the Pacific, or vice versa, may be dependent in part upon one or more of the following contingencies: (1) Continuity of the proper association from one side to the other. (2) Disproportionate representation of said association on one side as compared with the other, as for instance with the riparian song sparrow. (3) Lack of a complementary type on the opposite side, which would if present check invasion by competition; for example, the cases of the song sparrow and *Ammospermophilus*. (4) Unbalanced rate of dispersal in the representative races of the two abutting faunas; thus *Lepus c. deserticola* may have spread westwardly, through a period of time allowing for many generations, well into the margin of the habitat of *L. c. bennetti* because of greater "intra-specific vigor," the line of intergradation being thus forced over into the area where *bennetti* might be supposed to be best fitted to exist. According to this idea, in this and similar cases, unequal rate of distribution may carry one geographic race beyond the limit of its area of differentiation, and yet the frontier individuals, even for a considerable series of generations, maintain their original characters. The unequal "intra-specific vigor" may result from augmenting rate of reproduction, periodically reduced death rate (which would amount to the same thing), or from development innately of a greater degree of aggressiveness in disposition, as a specific trait—a proneness to wander, on the part of individuals. *Peromyscus m. sonoriensis* may be cited in the latter connection.

An assumption upon which the last consideration depends is contrary to the common conception among laboratory experimentalists, namely, that most if not all of the characters recognized by the systematic student of birds and mammals are somatic, subject to modification in the life-time of the individual or at least

within one or two generations. It is urged that should individuals be transplanted, say, from the desert to the San Diegan district, characters of color, quality of pelage or of plumage, size, and proportions similar to the race native in the new locality would promptly be acquired.

As an argument against this notion of the evanescence of subspecific characters, we wish to call attention to the numerous cases in Table C, where the ranges of forms extend in one direction or the other over into opposite faunal areas with their sharply contrasted conditions more particularly of humidity. Some of the mammals are of probably slow locomotion as regards home centers; so that many generations must have been subjected to the foreign environment to have allowed invasion to the distance attained. And yet in the extreme cases the characters of the stock form have been retained with no perceptible modification—an "experiment" in the laboratory of nature (see also table D).

As has already been made clear in the discussion on preceding pages, we cannot expect to derive universal laws for the behavior of species, to be applicable uniformly in any region like the San Jacinto area where two faunas meet. Perhaps the only general rule that can be laid down is that there *is no exact concordance* in the distributional behavior of all the animals of a region.

Upon reflection it is difficult to conceive of precisely the same set of delimiting factors operating upon any two species alike. The condition of diversity is thus explicable, as regards interfaunal invasion of individual species, degree of blending or distinctness between adjacent representative forms, and restriction versus cosmopolitanism in general distribution.

Possible generalities are as follows: That the more restricted as to association a form is in its distribution, the more liable is it to manifest the phenomenon of geographic variation. In other words the less adaptable a species the more chance for the action of the factor of isolation which is essential for the multiplication of subspecies, and hence of specific types. Operating to offset the effects of isolation are the processes of hybridization, and its probable climax, intergradation (see pp. 345, 374), which only long distance between differentiation centers can counterbalance (see Grinnell, 1904b, p. 372).

Where adaptable forms continuously through time and space invade radially towards one another, with but a narrow belt of intermediate conditions between the differentiation areas, specific distinction may be attained because of this very narrowness of the intermediate area. The intermediates being non-adapted and therefore relatively useless, would be eliminated. It is thus possible to account for the origin of such now separate forms as *Toxostoma redivivum* and *T. lecontei*, and *Dryobates scalaris* and *D. nuttalli*. These were doubtless not long ago intergradient forms, therefore subspecies.

By judicious observation it seems possible to select various degrees in the process of specific separation, on the margins of habitats. Some species are seen to blend perfectly, in others there is broken or mosaic intergradation, in others hybridization, as expressed in cases of fairly constant intervening type, and finally there are the distinct forms with no hybrids in evidence. In such a series we see the historical sequence in relationship preceding the "full species."

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PLATE 6

Map of the Life Zones of the San Jacinto area.

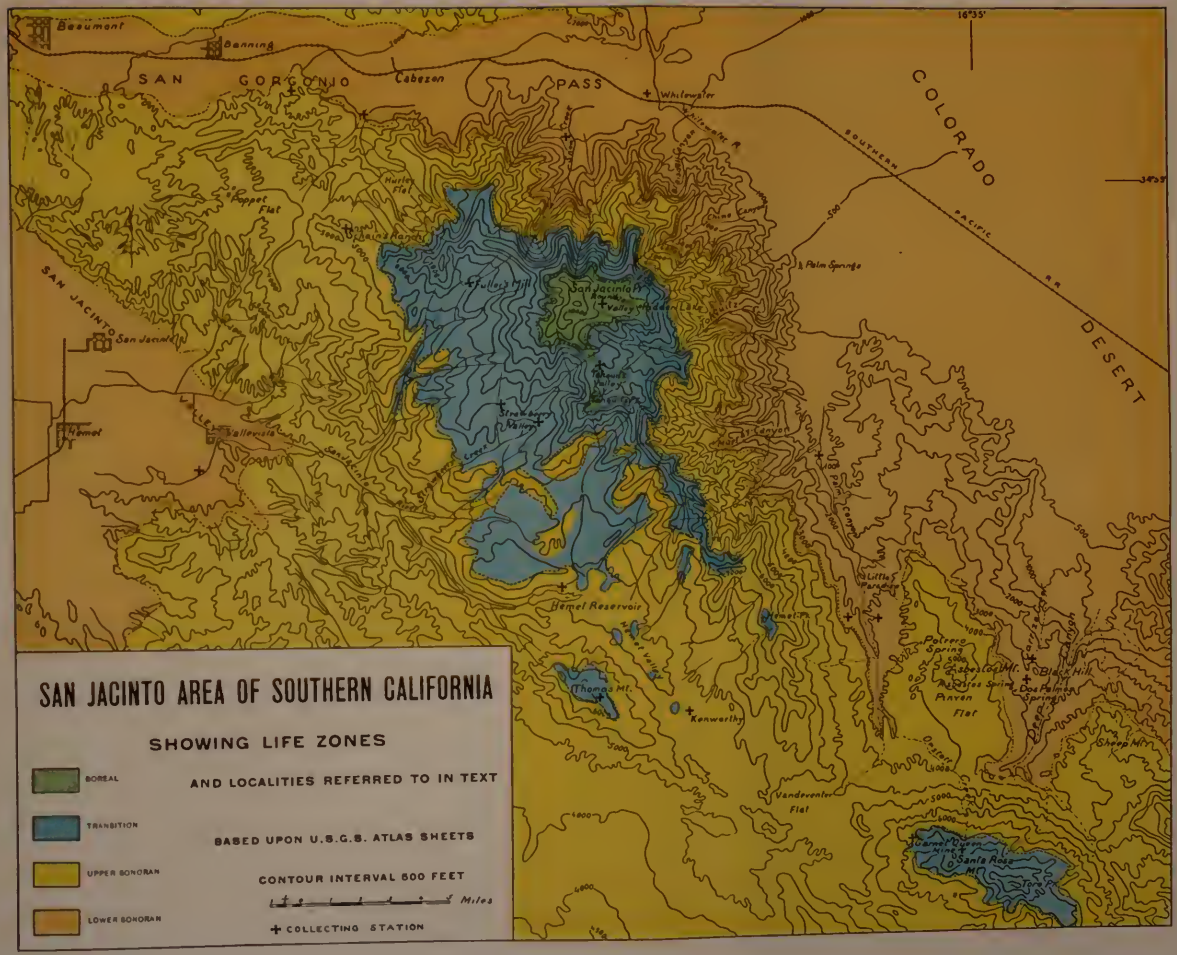
SAN JACINTO AREA OF SOUTHERN CALIFORNIA
SHOWING LIFE ZONES
AND LOCALITIES REFERRED TO IN TEXT
BASED UPON U.S.G.S. ATLAS SHEETS
CONTOUR INTERVAL 500 FEET
Miles
COLLECTING STATION
BOREAL
TRANSITION
UPPER SONORAN
LOWER SONORAN
SAN GORGONIO PASS
COLORADO DESERT
SOUTHERN PACIFIC RR
Beaumont
Banning
Cabezon
Whitewater
Poppet Flat
Hurley Flat
Schaina Ranch
Fuller's Mill
San Jacinto Pk.
Valley
Hidden Lake
Palm Springs
SAN JACINTO
San Jacinto
Hemet
Vallevista
Strawberry Valley
Hemet Reservoir
Hemet Pk.
Thomas Mt.
Kenworthy
Vandeventer Flat
Potrero Spring
Pinyon Flat
Black Hill
Sheep Mt.
Santa Rosa Mt.
Toro Pk.
16°35'
34°35'

PLATE 7

Profile along divide separating desert and Pacific drainages, in southern California, from the high southern Sierras to the Mexican line, showing life zones. This profile is of course not in a straight line between the terminal points. Care has been taken to represent the life zones in their proper relative extents with due regard to total distance, as well as to altitude. The diametrical dimension thus shown may be taken as an index in each case to the area involved. This statement has been verified by comparison with an ordinary zone map of the region.

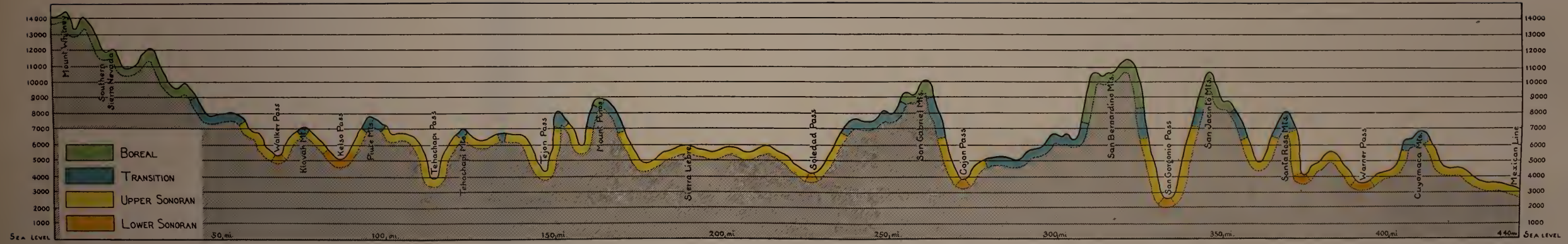
BOREAL
TRANSITION
UPPER SONORAN
LOWER SONORAN
SEA LEVEL
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
14800
Mount Whitney
Southern Sierra Nevada
Walker Pass
Kiavah Mts.
Kelso Pass
Piute Mts.
Tehachapi Pass
Tehachapi Mts.
Tejon Pass
Mount Pinos
Sierra Liebre
Soledad Pass
San Gabriel Mts.
Cajon Pass
San Bernardino Mts.
San Gorgonio Pass
San Jacinto Mts.
Santa Rosa Mts.
Warner Pass
Cuyamaca Mts.
Mexican Line
50 mi.
100 mi.
150 mi.
200 mi.
250 mi.
300 mi.
350 mi.
400 mi.
440 mi.

PLATE 8

Fig. 1. San Jacinto Peak, in back center, as viewed from Tahquitz Peak. The steep declivity in foreground rises from Strawberry Valley; at extreme right center is the edge of Tahquitz Valley. The patches of brush in the right foreground are chiefly composed of chinquapin (*Castanopsis sempervirens*) and manzanita (*Arctostaphylos patula*). Here is the summer home of *Passerella iliaca stephensi* and the forage ground of *Eutamias speciosus*, both being animals of the upper Transition zone. The trees on the ridge at the right are chiefly Jeffrey pines, those on the higher distant slopes are lodgepole and limber pines. The latter two are purely Boreal elements.

Fig. 2. Southeast wall of Strawberry Valley, showing lower Transition forest of black oak, incense cedar, yellow pine, and sugar pine, with silver firs of upper Transition on the higher portions of the slope. From this wooded slope were heard the notes of *Strix o. occidentalis;* other characteristic birds were: *Piranga ludoviciana, Nuttallornis borealis*, and *Xenopicus a. gravirostris*.

Fig. 1

Fig. 2

PLATE 9

Fig. 1. Typical Boreal meadow at about 8200 feet altitude in Tahquitz Valley; photograph taken July 27, 1908. The conspicuous plant is *Veratrum californicum*, and living in its clumps were *Melospiza l. lincolni* and *Sorex ornatus*. The surrounding trees are Jeffrey and lodgepole pines and silver firs. In these were *Regulus c. cineraceus*, *Empidonax wrighti*, and *Sphyrapicus thyroideus*.

Fig. 2. Lower Palm Cañon near its mouth at the east base of San Jacinto Peak; altitude 800 feet above sea-level; photograph taken June 16, 1908. Washington palms, Pluchea, catclaw, and mesquite served to diagnose the locality as within the Colorado Desert faunal area. Some Lower Sonoran birds and mammals at this point were: *Icterus c. nelsoni*, *Auriparus f. flaviceps*, *Polioptila plumbea*, *Lophortyx gambeli*, *Peromyscus e. eremicus* and *Pipistrellus h. hesperus*. In addition there was present along the stream the San Diego song sparrow (*Melospiza m. cooperi*), which was here resident under desert conditions of extreme type.

Fig. 1

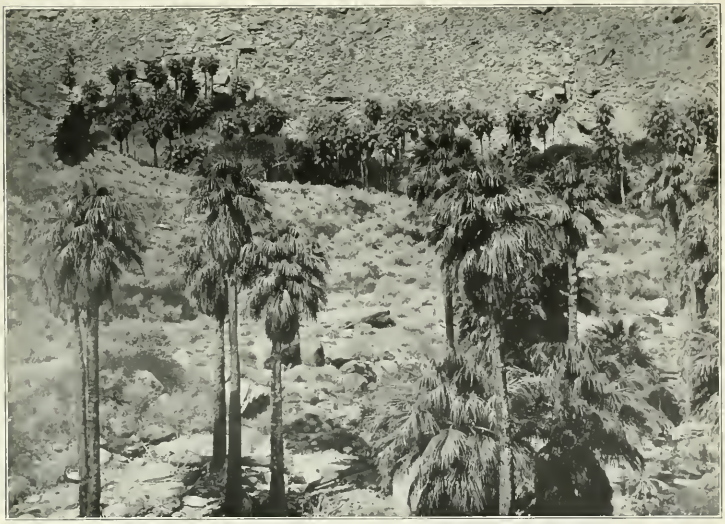

Fig. 2

PLATE 10

Fig. 1. Portion of mesa at 3500 feet altitude near Dos Palmos Spring on the desert slope of the Santa Rosa Mountains close to the upper edge of the Lower Sonoran Zone; photograph taken May 27, 1908. In the background, on the shaded slopes, are such Upper Sonoran shrubs as juniper, Rhamnus, scrub-oak, and with them such birds as *Aphelocoma c. californica*, *Thryomanes b. charienturus*, and *Pipilo c. senicula*. In the foreground Lower Sonoran vegetation predominates, with such birds as *Amphispiza b. deserticola*, and *Helcodytes b. couesi*. Crossing this exact place was the line of traps which produced in a single night (May 30, 31) the following mammals: *Perodipus a. agilis*, *Dipodomys m. simiolus*, *Neotoma l. desertorum*, *Perognathus p. baugsi*, *Perognathus f. pallidus*, *Peromyscus c. eremicus*, *Ammospermophilus l. leucurus*, and *Notiosorex crawfordi*. Other mammals taken in the vicinity were *Sylvilagus b. cinerascens* and *Peromyscus b. rowleyi*, thus showing the peculiar zonal overlapping at this point.

Fig. 2. Female *Vireo vicinior* on nest located 850 millimeters above the ground in bush of *Adenostoma fasciculatum*. The nest is seen to be supported not only at several points in the rim, but by the stiff twigs at sides and bottom. This was a species of extraordinarily limited range (see p. 291).

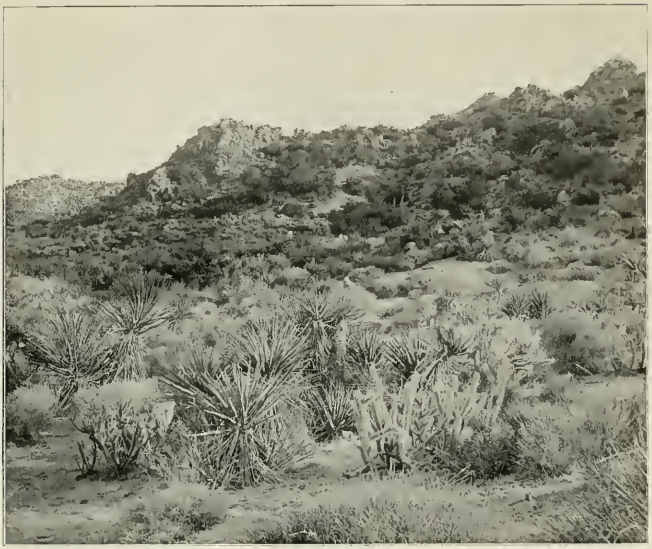

Fig. 1

Fig. 2

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